K LASSIE'S CYLENDERS BY L.B.S.C.

THE MODEL ENGINEER

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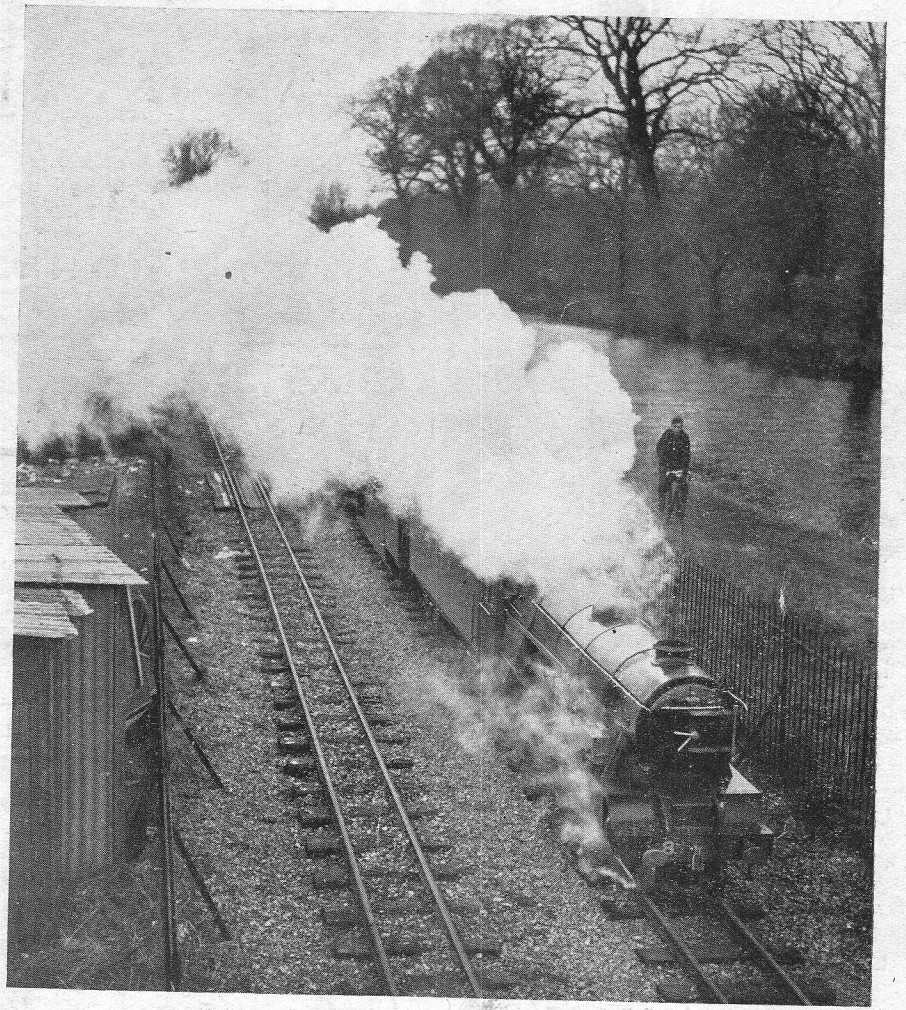


The 15-inch gauge Romney, Hythe and Dymchurch Railway resumed public traffic on March 1st. Our photograph shows the first post-war train en route. *Full normal service may be restored during the coming summer*

THE MODEL ENGINEER

APRIL 4th, 1946

VOL. 94. No. 2343

Smoke Rings

Proposed Society for Pontefract

IT has been suggested that, if sufficient support is forthcoming, a Society of Model Engineers be founded in Pontefract. If any reader in the town, or its surrounding district, is interested in this suggestion, he is invited to write to Mr. John Lea, 156, Southgate, Pontefract, Yorks., with a view to arranging for a preliminary meeting at which the scheme can be discussed.

Thank You!

A READER, who is a Doctor of Physics and an Associate of the Royal Society of Metallurgists, informs me that he has read THE MODEL ENGINEER since he was a boy at school, and he offers his congratulations to us and our contributors for the continued freshness and enthusiasm displayed in our pages, to say nothing of the downright commonsense.

Prowess on Tyneside

ON his return from a recent visit to Newcastle-on-Tyne, Mr. J. N. Maskelyne reported that he was much impressed, not only by the welcome extended to him by the members of the Tyneside Society of Model Engineers, but by what he had seen at the exhibition arranged for his inspection. Almost every conceivable kind of model was to be found there, and the general standard of workmanship was most satisfying. The general enthusiasm of the present membership of the Society is, perhaps, best indicated by the fact that, whereas the pre-war Newcastle Society of Model Engineers had less than fifty members, the post-war Tyneside Society, which began months ago with a nucleus of enthusiasts from the former body, has already exceeded one hundred and twenty! So it would appear that all is set for a prosperous future for model engineering in a city which, historically and commercially, is regarded as a "home" of engineering. Mr. Maskelyne was fortunate in being able to pay a brief visit to the Newcastle Municipal Museum, and found there a collection of relics which served to emphasise still more the fact that the city is an engineering "birth-place." Many of the exhibits are actual pioneer specimens of their types, in addition to which many fine models commemorate "first examples" of several different engineering products of the district; this is particularly apparent in the very fine collection of ship models, while the engines of Parson's celebrated *Turbinia* are preserved intact. To appreciate to the full all that is to be seen in the building would require at least a week. Moreover, there is plenty of evidence of mutual regard between the municipal authorities and the Tyneside Society of Model Engineers, and together they should achieve a most prominent place in the future progress of British model engineering.

News from Rotherham

MR. W. H. TUNNICLIFFE, Hon. Sec. of the Model Engineering Section of the Rotherham College of Technology Engineering Society, writes:—"At last I am able to report progress of the Model Engineering Section of this Society. We have now a membership of 65, which we think is good for a borough the size of Rotherham, which has a population of 88,000. The workshop is now in use by the members every Tuesday and there is an average attendance of twenty members. Several interesting models are in progress, including a 'Midge,' 'Hielan' Lassie' (three), and a refrigerator compressor; also, the renovation of several old stationary engines. More work is on the way and the steamship people are beginning to get busy. The section had a very successful exhibition in January, at which 756 persons paid for admission. As a result, we were able to hand over £14 to the Rotherham hospital. The 'workshop night' is every Tuesday from 6.30 to 9 p.m. On Tuesday, April 9th, Mr. W. Acaster, of The British Oxygen Company, is attending to demonstrate various methods and processes of brazing and welding with his company's equipment. Visits are being arranged to nearby locomotive-building establishments and running sheds. It is very interesting to see every Tuesday night the numbers of new, old, and ancient copies of THE MODEL ENGINEER being brought out in order to study them for particulars of the various models and appliances that are in progress. Then, too, there are the arguments and comments of the members as to the merits or demerits of the various contributors in THE MODEL ENGINEER. 'L.B.S.C.' is easily the first favourite, followed, very closely, by Mr. Westbury."

Percival Marshall

A Model Yawl

By E. M. HUGHES

IT is some time since I first wrote to the "Skipper" of THE MODEL ENGINEER to submit a short article on an improvised countershaft, made from a portion of a bicycle-frame.

But afterwards I changed my address, causing me to be parted from my workshop.

At first, I was lost. Although spare time these days is so limited, the little time I used to spend in my shop was very refreshing. This was due I think to the fact that my work is in a drawing office and I found it very satisfying to be able to spend just a few hours working with my hands.

Well! after a time I started making solid, scale models of aircraft. These I could manage on the kitchen table, with the help of a penknife and a few small tools such as drills and files; also the material was fairly easy to obtain. After making one or two, I became rather interested in this means of carrying on with our hobby; and just about that time, I was reading rather an interesting book on the adventures of a Miss Winifred Brown in a 45-ft. Bermuda-rigged yawl, in which she made two very interesting sea voyages, one to Norway in 1937, and the other to Spitzbergen in 1938. In the back of this book, which, by the way, is titled *Duffers on the Deep*, are reproduced drawings of the sheer and accommodation plans, also the sections and a rigging plan, these being approximately to a scale of 1/80 or 0.0125 in. to 1 in. Having always been interested in small boats, I decided to make a scale model of this ship to the above mentioned scale and, as far as external fittings were concerned, I would attempt to make everything as true to life as possible.

As mentioned before, my supply of wood-working tools was very limited, but a friend kindly loaned me a chisel and a small spoon gouge, with the use of which I found I was amply supplied.

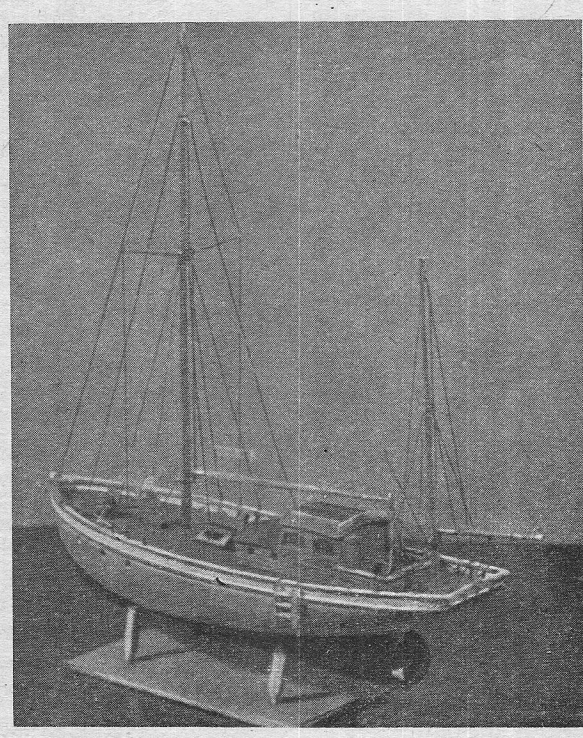
Well, after a period of ten months of spare time, the results are seen in the photograph. The hull is hollow; the wheel-house and self-bailing cockpit is a unit on its own made up from 1/64-in. mahogany. The roof of the wheel house is removable to allow one to see the wheel-house furniture and companion down into the engine room.

Most of the mast fittings are made from an old celluloid set-square filed to shape with a nail-file and suitably painted to represent galvanised fittings. All the running rigging which could possibly be made to work does so; also the boom goosenecks, which are also of celluloid.

This letter seems to prove what has often been mentioned in "Smoke Rings," that, although at the present time we may not be able to carry on model engineering in the strict sense of the words, most of us are not satisfied with only thinking and planning our post-war activities, but are engaged on some actual model-making, however trivial it may be.

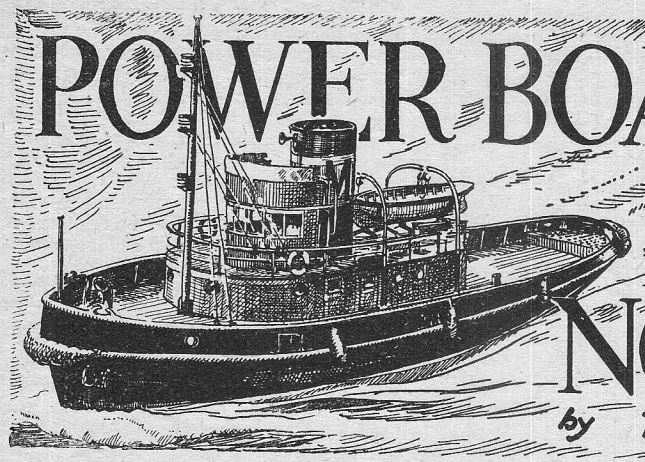
Another thing, as I have often told my friends who say they cannot make models because they have not the equipment, is, that large quantities of expensive tools are not required if they use a little initiative and thought. I find that wonders can be performed with an ordinary penknife.

Of course, this kind of model making is not nearly so satisfying as the building and running of a locomotive, or racing hydroplane, or the designing and constructing of some special piece of equipment for the workshop; but I find it is just the necessary amount of relaxation I require to relieve the monotony of our everyday life.



From book reading to model making!

POWER BOATING UP NORTH



by T. R. BARNETT

THE last few years have brought great changes in the construction of marine engines, due to the advance in the art of welding and fabrication, which means, to the uninitiated, that instead of castings being used, plates are cut to shape, parts built-up and welded together. The entire welded construction is in ship-quality mild-steel of approximately 28 tons tensile strength.

It is some 14 years since I heard of a triple-expansion engine being fabricated on the Tyneside ; this engine proved successful and I often wonder if the idea originated from models. The engine in my model " Jane " is an ordinary slide-valve, 1-in. bore and 1-in. stroke, has not a single casting and has been running some 25 years. In the old days of model engineering, good castings like the Stuart Turner steam engine sets of to-day were a model maker's dream. We usually procured a piece of brass tube with accurate bore, fitted rings on ends to take cylinder covers, a block of brass for slide-valve face and steam-chest, and built-up the guides from $\frac{1}{8}$-in. sheet brass. The bed-plate and crankshaft were also built-up, but piston, eccentric and flywheel were turned out of the solid ; connecting-rod, eccentric-rod, and all other parts were filed out of the solid. All the parts were soft-soldered together and when finished and painted, they were difficult to distinguish from castings. Now, was our time wasted ? No, I think not ; for, besides having to use plenty of initiative, valuable skill in the handling of tools was also obtained. To-day one can buy a set of finished parts and simply put them together ; but I think the beginner will have more pride and care for an engine he has constructed himself, even if it is a fabricated job, and it will certainly train him for after-life to shun " the line of least resistance."

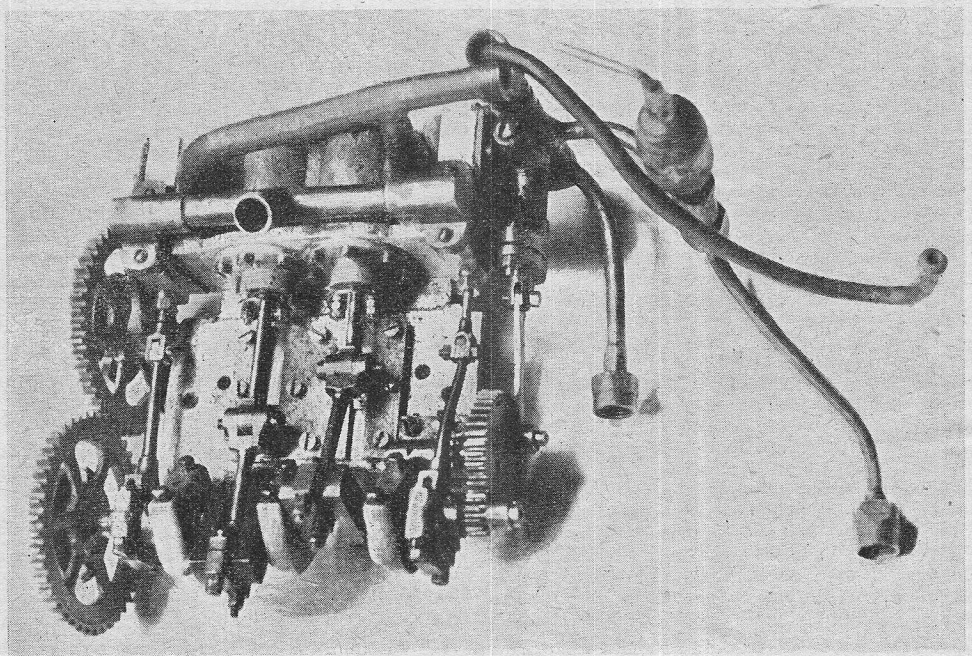
Mr. G. R. Shand, an old " steam " member of the Tynemouth Club, who builds his models throughout, brought up a new boat last season, and when I looked down the engine-room I saw a fine example of modern fabrication : two steel-tube cylinders, single-acting high-speed type with slide-valve on top operated by bevel wheels. All parts brazed and silver-soldered together, cased in and beautifully finished with oil-pump for forced lubrication of working parts ; also a lubricator for internal parts, which is very necessary for this type of high-speed engine. Nevertheless, despite our member's great reputation and repeated efforts, the engine was not

Mr. R. S. Anderson catches his model tug-boat, " Hendon "

satisfactory and was very unreliable, which will not do for the steering competitions! However, one morning, Mr. Shand arrived at the boathouse recently with a new engine, but this time, $\frac{3}{4} \times \frac{3}{4}$ single-cylinder ordinary slide-valve double-acting type, which he had made himself and it looks as if he will have something reliable and economical for next season. For hard running and reliability this type of engine is to be strongly recommended, it should have large adjustable bearings and large steam-ports. It will run through the season and require only a few adjustments in the winter when in dry dock. The slide-valve is the most economical for models, as piston-valves soon wear and pass steam, with consequent loss of power, which is disastrous to straight running. It is absolutely necessary to keep slide-valve and cylinder-face steam-tight, which is done by rubbing on a piece of glass with sand and water, *not oil*. Both slide-valve and cylinder-face should be so treated at least once each season.

Up North, our best steam models have this type of engine and a $\frac{3}{4}$ in. $\times$ $\frac{3}{4}$ in. is ample for a 5-ft. boat, and will drive it fast enough for the steering competitions with safe handling. Some of our models attain a speed of 10 miles per hour; but speed is a secondary consideration for steering, although 5 m.p.h. is desirable and is quite enough to handle safely. My model *Jane* has a speed of $4\frac{3}{4}$ m.p.h., and her records have already appeared from time to time in THE MODEL ENGINEER. My other model steam yacht *Ellesmere*, a proper die-hard and well known to old readers, was easily doing her old speed of 4 m.p.h. last season with her original boiler and engine, and running just as well and reliably as she did on her trial trip 43 years ago. The engine is 1-in. bore $\times$ $1\frac{1}{2}$-in. stroke; working pressure 30 lb. per sq. in., and length of hull 6 ft. 3 in. Her last dry-docking and overhaul took place in 1937.

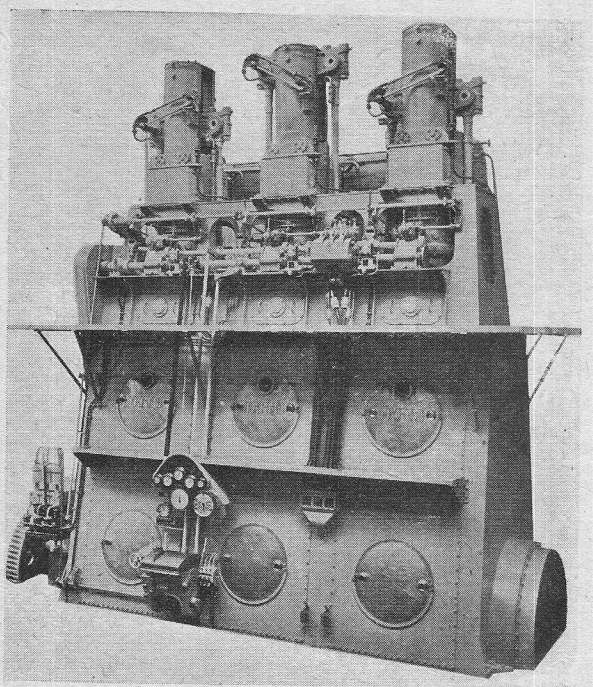
To-day, with all the modern contraptions of high-speed, double-cylinder, single-acting engines, water-tube, pot and flash boilers, etc., the student of marine engineering may think that the engine I recommend for the steering competitions is somewhat out of date; I would remind him that triple- and quadruple-expansion engines are being built to-day in fairly large numbers, and that the Liberty ships which brought over our food during the war were propelled by triple-expansion engines. I also note that the L.N.E.R. have just placed an order on the Clyde for a large paddle-steamer to carry passengers around the Scottish isles and lochs. Add to this steam turbines of the Parsons type which helped our navy to win the war, Diesel engines of many types, electric motors, as in the liner *Normandie*, and the gas turbines which are emerging from the experimental stage. With all these different ways of pushing a ship along, the student of to-day, has a tough proposition to face.



Horizontal twin-cylinder engines as used by the Sunderland M.P.B.C., $\frac{5}{8}$-in bore by $\frac{5}{8}$-in stroke

The Doxford Diesel Engine

The photographs, herewith, of the Doxford Diesel engines produced at Sunderland by William Doxford & Sons, show types which have proved very successful and are greatly favoured by shipowners for their smooth running, reliability and economy. The unique design is



Three-cylinder engine, 1,800 b.h.p.

Photo by courtesy of William Doxford and Sons Ltd., Sunderland

very interesting, as each cylinder has two pistons, three connecting-rods, four guides and, of course, three crankshafts and is termed the opposed-piston type of engine. Note the guide, transverse lever, and two connecting-rods on top of each cylinder for the upper piston. The upper connecting-rods pass through the casing to crossheads and guides each side of main guide for the lower piston. There are two camshafts, front and back of engine, chain driven from the main shaft, to operate fuel-valves. The compression pressure when the two pistons are nearest to each other is about 480 lb. per sq. in., and the temperature is about 1,000° F., which ignites the fine spray of oil injected by the fuel-valves at the proper moment, causing expansion of the gases and forcing the pistons apart. Water circulates around the cylinders to keep them cool enough for working conditions.

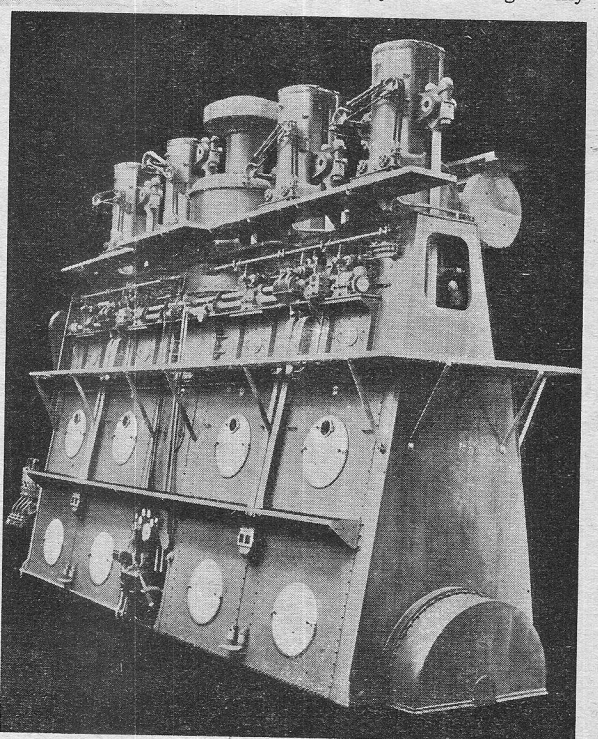
The large worm-wheel is the turning gear, which also acts as a flywheel and is secured to the main shaft. The turning gear is used to move engines when overhauling in port, and engages a worm and shaft diven by a steam engine or electric motor. The worm has a proper arrangement for engaging and disengaging. Serious accidents have occurred through neglect of disengaging when taking a turn out of the engines, previous to leaving port.

The precautions necessary before taking a turn out of the engines are : (1) see that the turning gear is disengaged ; (2) see that the propeller is all clear of any obstruction.

Mr. G. B. Gebbie, managing director of Doxford's, informs me that the engine is proving to be an outstanding success and, so far, 500 vessels have been fitted with it. At the moment, 500,000 b.h.p. are under construction, or on order. Eleven firms are building these engines under licence in this country and two in North America.

Many tales of woe could be told of the early days, from the time of the inventor, Dr. Diesel, and the disappointments and struggles before the present high standard of efficiency and success was reached ; and, to-day, experimental work and improvements are still in progress by many firms building other types of engines.

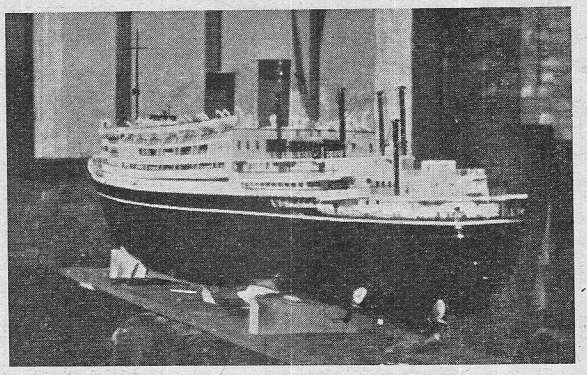
I well remember some 15 years ago going on board a new oil-tanker in dry dock on the Tyne ; she was four years old and practically new. Imagine my



The four-cylinder engine with central scavenge pump, 4,250 b.h.p.

Photo by courtesy of William Doxford and Sons Ltd., Sunderland

surprise when told that the Diesel engine was to be scrapped and the heart-burning as we proceeded to knock those practically new engines to pieces for removal. We men of the sea, temporarily ashore, heard much from those gallant lads of whom we hear so little, the ships' engineers, of their unsuccessful attempts to run them. Now long past, this particular type, which was fitted to many large vessels, will always remain a bitter memory to the ships' engineers.



A 7-ft. model of the "Dominion Monarch," built by Mr. R. S. Anderson

But another Diesel engine was to be installed, and the new one was Doxford's; so the owners, after their great loss, must have had great confidence in their selection.

Steam boilers of special construction are installed with Doxford engines, greatly increasing economy. The exhaust is led to the furnaces and maintains steam for driving auxiliaries and pumps. When in port, oil-burners are used.

Returning again to fabrication, these engines have been so constructed for the last twelve years, and the change-over enabled a saving of weight of nearly 25 per cent. in the complete engine without in any way impairing its strength, rigidity or reliability in service. From castings, such as cylinders, guides and a few small parts, have been retained where the change-over to welded steel does not appear to offer any advantages. The welding is carried out by the metal arc process, either d.c. or a.c., which is the latest development and likely to be more adopted in the future. Turbine double-reduction gear-cases, turbine casings, condensers, triple-expansion engines, and various types of Diesel engines are now nearly all fabricated, the exceptions being, housings for bearings, blade carriers for turbines, and h.p. turbines in some cases, also other small castings.

There is a saying up North: "That's where they mak 'em," and refers to Sunderland, where this fine engine was produced; and when watching the many fine models built by the Sunderland Model Power Boat Club, I have often heard the above remark. Many of their models were driven by twin-cylinder horizontal engines of the ordinary slide-valve type, neat little engines and quite a diversion from the vertical; their smooth running and reliability I often admired. They were usually geared up to drive twin propellers. I feel sure the Sunderland lads will some day be springing a surprise, and I wonder if we will really see a model "Doxford" engine propelling one of their models at Roker Park lake, where I have spent many pleasant hours.

The *Dominion Monarch* is the highest-powered motor-vessel in the world's mercantile marine, and has Doxford's engines with 32,000 b.h.p. and a speed of 21 knots.

This fine liner is of special interest to the Tynemouth Club, because one of our members, Mr. R. S. Anderson, well-known Northern power-boat enthusiast, and captain of our power-boat section, has constructed a really first-class working model of this fine example of Tyne shipbuilding. Incidentally, Mr. Anderson is assistant head foreman shipwright where she was built, Swan, Hunter & Wigham Richardson Ltd.

He has constructed many fine models, and this one, seen in photographs herewith, occupied two years of his spare time. Here is a brief description: The model is constructed on the same lines as the ship and the dimensions are as follow:—Length, 7 ft.; beam, 10¼ in.; depth, 6½ in. to main deck. She was built on keel blocks, keel plate laid with centre kelson, floors, frames, beams and the hull plated with small plates. There are four propellers driven by two Stuart Turner steam engines ⅜-in. bore × ⅜-in. stroke, each engine driving two shafts. Steam is supplied by a centre-flue boiler of solid-drawn copper tube, silver-soldered, and the working pressure is 60 lb. per sq. in. Furnace and cross tubes are also solid-drawn copper tube and silver-soldered.

All hull fittings were hand made. Deck with leak margins are laid with white holly. Verandah cape and all details, even to the swimming-pool, are fitted the same as in her big sister.

I have not seen this model in action on our lake, but Mr. Anderson assures me that everything was very satisfactory when she was running in his testing tank at home.

Last season, at one of our regattas, several models were on show outside the boathouse when Mr. Anderson, somewhat annoyed, told me that he was putting his model away in the locker as the boys would not keep their hands off. I went to the rescue and simply told those boys that, when looking at models, they must keep their hands in their pockets, which they did and the models remained on show.

I have heard more than once in our boathouse—the critic is always busy—that Mr. Anderson keeps his models for show purposes and seldom runs them on the lake. However, look at the photograph herewith, taken recently, which will prove this statement to be wrong, and note the wake from propeller as he catches his fine model tug-boat *Hendon*, an exact model of this Tyne tug-boat. This model won the silver cup at THE MODEL ENGINEER Exhibition, 1937.

(To be continued)

Woodworking Saws

By W. J. HUGHES

Their choice and general maintenance, including reconditioning

HOW often one sees someone who should know better struggling away trying to saw down a plank with a saw which obviously isn't up to its job. It has, perhaps, patches of rust on the blade, and keeps jamming in the cut for want of setting. In addition, it obviously needs sharpening.

When I gently chided a friend of mine recently for this sort of performance, he said that he thought the job wouldn't take long, and it didn't seem worth while going to all that trouble. When I said that the half-hour or so that the re-conditioning would take would be saved amply in time and energy, not only on this job, but on others to come, he said (in a burst of confidence) that the trouble was that he really didn't know how to tackle it. So a little practical demonstration followed, with, I think, some benefit to his over-worked sweat-glands, and certainly to his temper.

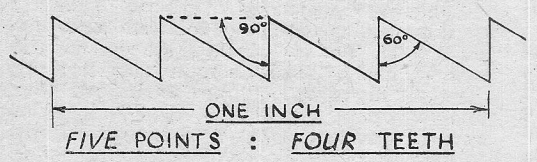


Fig. 1. Difference between number of teeth per inch and points per inch. This figure also shows shape of teeth of rip-saw

Many model engineers will use their wood-saws but little, possibly with results outlined above. We're all inclined to procrastinate, some more than others ; but, as the old proverb hath it, "Procrastination is the thief of time," and never was this truer than in this case. After which little bit of moralising, shall we get down to business ?

Fig. 3. Shape of teeth of cross-cut and tenon saws

Types of Saws

The types of hand-saw most commonly in use are the rip, half-rip, cross-cut, panel, tenon, and dovetail.

For convenience' sake the first two may be classed together as rip-saws, and the number of "points" per inch varies from 3½ to 6. (Note : Fig. 1 shows the difference between the number of "points" per inch and "teeth" per inch). For general ripping work a saw should have 5 or 6 points to the inch. As its name implies, a rip-saw is used for ripping down the grain of wood.

Cross-cut saws have teeth points varying between 5½ and 9 to the inch ; for general work one with 7 to 9 should be chosen. Panel saws have similar but finer teeth, the number of points varying from 10 to 12 to the inch.

Tenon saws may have from 12 to 16 points per inch ; 14 will be found right for most purposes. The teeth of dovetail saws are very fine, from 18 to 30 points per inch, the blade being of very fine gauge steel. My own has 26 points per inch, and its "kerf" or cut is less than 1/32 of an inch in width.

These last two types are frequently called "back saws," because the thin blade is strengthened by means of a brass or steel "back" which is clamped on the back edge of the blade.

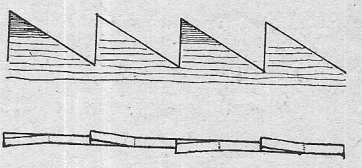


Fig. 2. Plan and elevation of teeth of rip-saw, showing setting and sharpening

Choice of Saws

A decently-equipped workshop should contain at least a rip-saw, cross-cut saw, and tenon-saw ; and since like most good tools a good saw will probably outlast its owner, it need hardly be stressed that only saws of reputable make should be purchased. They may cost a shilling or two more, but in wear, balance, and less frequent necessity for sharpening and setting they will soon earn that. If lack of funds prevents acquisition of all three, I would advocate first the cross-cut, then the tenon, then the rip-saw. One *can* cut down grain with a cross-cut, but not across grain with a rip-saw.

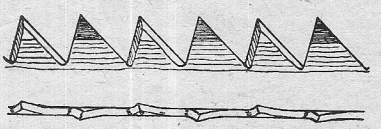


Fig. 4. Plan and elevation of teeth of cross-cut saw, showing how teeth are bevelled to give sharp cutting points

In rip and cross-cut saws, the blade should be taper-ground, so that the thickness of the blade tapers from tooth to back, which provides additional clearance in the kerf and reduces the amount of set required. It should be flat and straight, and flexible ; a test is sometimes

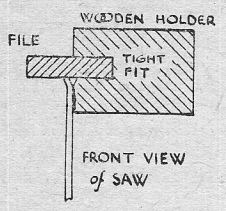


Fig. 5. Showing method of holding file during "jointing" operation

advocated that the blade should be bent until the point meets the handle, but I personally would not recommend this, as the saw might be strained to an undesirable extent. The teeth should be uniform in size and set, and should be very sharp.

The "back" of a tenon saw should be heavy and dead straight, and should grip the blade evenly all the way along.

Shapes and Angles of Teeth

The rip-saw has teeth shaped as in Fig. 1, and sharpened as in Fig. 2, and its action is that of a series of small chisels paring the wood away. If a rip-saw be used to cut across the grain it

Fig. 6. Showing irregularity (exaggerated) of teeth after "jointing" operation

will tear the grain very badly; since it cannot sever the fibres, it pulls them out piece-meal.

The teeth of a cross-cut or a tenon-saw are shaped as at Fig. 3, and sharpened as Fig. 4. The wood-fibres are severed by the sharp points of the teeth, so that a clean edge is made to the kerf.

All teeth are "set" so that the kerf is wider than the thickness of the blade, which allows clearance for the sawdust. It is accomplished by bending the tip of the first tooth to the left, the

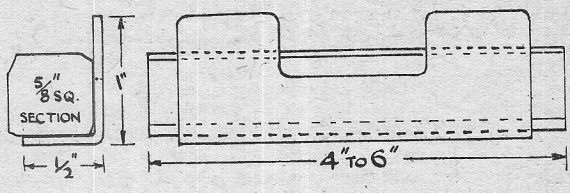


Fig. 7. Showing jig to simplify saw-setting

second to the right, and so on alternately up the blade.

Jointing and Re-shaping

When a saw is very badly worn it is necessary to "joint" the saw-teeth, and then to re-shape them before setting and sharpening. With normal use and care, this is very rarely necessary, especially if sharpening is carried out correctly.

"Jointing" (sometimes known as "topping") consists of filing the tips of the teeth until they are all level. The saw is held in the vice, and the teeth are filed by passing a 10-in. hand-file along them, the file being lengthwise to the saw. (See Fig. 5). A piece of hardwood, say, 6 in. by 1½ in. by 1 in., may be grooved so that it jams tightly on the edge of the file, and will help in holding the file and keeping it square with the blade, as indicated.

When all the teeth are level with one another they will probably be very uneven (Fig. 6), and the next operation is to file them until they are all the same size and shape. For the sake of economy, a triangular saw-file should be chosen whose width is a little more than twice the depth of the saw-tooth, which will ensure that all the corners of the file may be used.

The saw may be clamped in the vice between two suitable strips of wood (say, of 2½ in. by ¾ in. section) so that little more than the teeth projects above them, which will stop "chatter" and so be less productive of noise and of wear on the file teeth. Whatever the type of saw, this

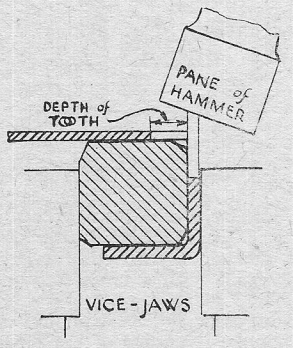
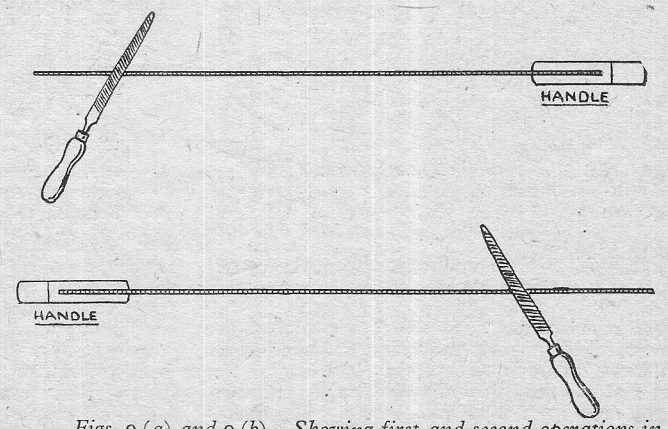


Fig. 8. Showing setting-jig in use



Figs. 9 (a) and 9 (b). Showing first and second operations in sharpening a cross-cut saw

shaping should be done filing at right-angles to the blade, and care is needed to get the teeth uniform.

Setting

Various types of automatic saw sets are obtainable, but are not recommended by the best makers, and the financial outlay is scarcely justifiable for the average amateur. However, he will be repaid amply by making up the little gadget shown in Fig. 7, which will greatly help, when setting, to ensure that exactly the same amount of set is given to each tooth. If this is not so, then the saw may not cut truly.

The gadget consists of a piece of $\frac{5}{8}$ in. or $\frac{3}{4}$ in. mild-steel of square section, with the corners chamfered as indicated at an angle of 20°-25°. The width of each chamfer may be made to suit a different size of saw—it should approximate to half the depth of the tooth to be set. The fence is made from a piece of 16-gauge mild-steel or brass bent at right-angles, and with a gap cut in its front as shown. In use the block and the fence together are gripped tightly in the vice.

Setting is the operation which follows on re-shaping, or, if jointing and re-shaping have not been necessary, is the first operation. The blade of the saw rests on the block, with the teeth up to the fence and overhanging the chamfer. With a cross-paned hammer, of, say, half-pound weight, two or three light blows are given on each *alternate* tooth, the hammer being held at an angle corresponding to the chamfer, which will lay the projecting part of the tooth down to the chamfer (Fig. 8). The hammering is, of course, done in the gap in the fence, and the saw is moved along the block as necessary. When the alternate teeth have been set, the saw should be turned over, and the remaining teeth set in the other direction.

Fig. 10. Showing how half-round file was used when triangular was not available

Fig. 11(a). Showing teeth rounded and worn before sharpening

Fig. 11(b). Teeth after sharpening

Where the original set has not been filed away in the re-shaping (and this will only occur in very badly worn saws), the teeth should be re-set following the original direction. Heavy blows should *not* be used in setting, or the blade may be buckled, or even develop cracks. Not more than half the depth of the tooth should be set, for the same reasons.

Sharpening

As may be seen in Fig. 2, the front edge of the rip-saw tooth is at right-angles to the plane of the saw, so that, of course, the sharpening will be done at right-angles. The setting will have damaged slightly the cutting-edges, so that it is necessary to touch this up even after re-shaping.

The saw is clamped between the two wooden battens with about $\frac{1}{2}$ in. projecting. The file is laid in the "gullet" (the angle between two adjacent teeth) with equal pressure against the back of the first tooth and the front of the second one, and two or three light strokes given. The file is then laid in the next gullet and the same number of strokes given, and so on down the saw.

The knife-like edges of the cross-cut saw are obtained by filing at an angle to the plane of the blade, and obviously the more acute the angle at which the file is held, the larger will the cutting-bevel be. For general use, the bevel should be 55° to 60°, although for soft woods it may be as acute as 45°.

The method is as follows: with saw-handle at the right-hand side, grip the saw in the battens, with little more than the teeth projecting. Working from the point end, the file is placed at the correct angle with equal pressure against the *back* of the first tooth set *away* from the operator, and the *front* edge of the tooth set towards him, this tooth being to the right of the file. The file should be pointed in the backwards direction, i.e. towards the handle end. Give three or four light strokes, then place the file in the next *alternate* gullet, file this, and so on until the handle end is reached.

Reversing the saw in the vice, so that the handle is to the operator's left, and starting at the point again, the remaining alternate teeth are now filed. Figs. 9a and 9b show this operation.

To assist in keeping the same amount of bevel on each tooth, a few parallel lines may be chalked on the bench top at the correct angle, and the file kept lined up with these. If the same bevel is not given from one side as from the other, the saw will tend to cut out of truth.

Panel saws and back saws may be sharpened in the same manner as cross-cut saws, but, due to the smallness of the teeth, much greater care will be needed to keep them all the same size.

Care and Maintenance of Saws

When once set, saws will usually stand sharpening three or four times before re-setting is again necessary, though neither should be delayed unduly, owing to the risk of buckling the blade if it is necessary to force the saw through the wood.

Sawing should be an unhurried, steady arm movement, the trunk moving but little, and the full length of the blade used, *not* just a few inches in the middle of the edge. Since the saw only cuts on its forward movement, it is a waste of energy to press on when coming back; even on the forward stroke little pressure is necessary, as the angle of the handle to the cutting-edge is so designed that the pressure is resolved into a downward force as well as a forward one.

(*Continued on page* 339)

A Free-lance Traction Engine

By C. G. BEDFORD

THIS is what I term my "war-time" product, to wit:—one only, Showman's Traction Engine. She was completed early in 1945, after roughly two years' spare-time working, and has gone through her trials splendidly.

Actually, she was built around a piece of 5-in. O.D. copper tube that a friend gave me some years ago and what I really had intended to use for a vertical boiler. On thinking things over, I came to the conclusion that it would look much better as a locomotive boiler, and so work was started on it right away.

Firebox wrapper, outer wrapper, tube-plates, etc., are all fashioned from flattened tube, the whole lot riveted and brazed, with horn-plates bolted on in $\frac{1}{8}$-in. steel.

The whole engine is built from scrap material and only four castings were used, viz. :—the cylinder-block, flywheel, and the two oval hubs for the rear wheels. Road wheel rims were made from large-diameter oil-pipe, the spoke rings cut from $\frac{1}{8}$-in. steel plates, welded to the inside of the rims, and afterwards turned and cleaned up, the rear wheels, of course, having two spoke rings each.

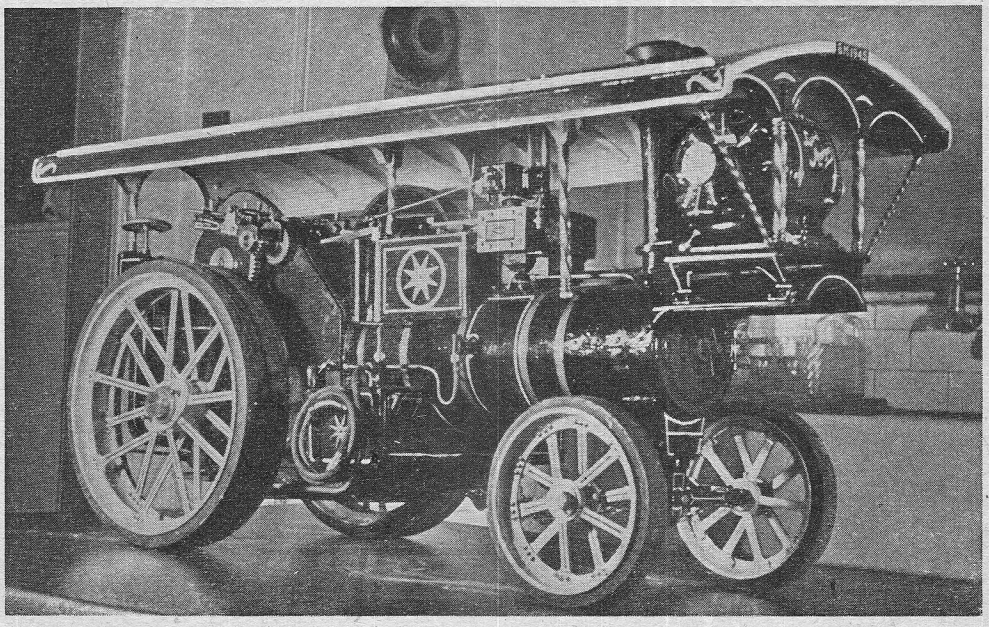
Cutting the spokes was a heart-breaking job, as it meant a lot of hack-saw work, there being fifty-two spokes in all; but it was worth while as, when built up, the wheels looked as it was intended they should.

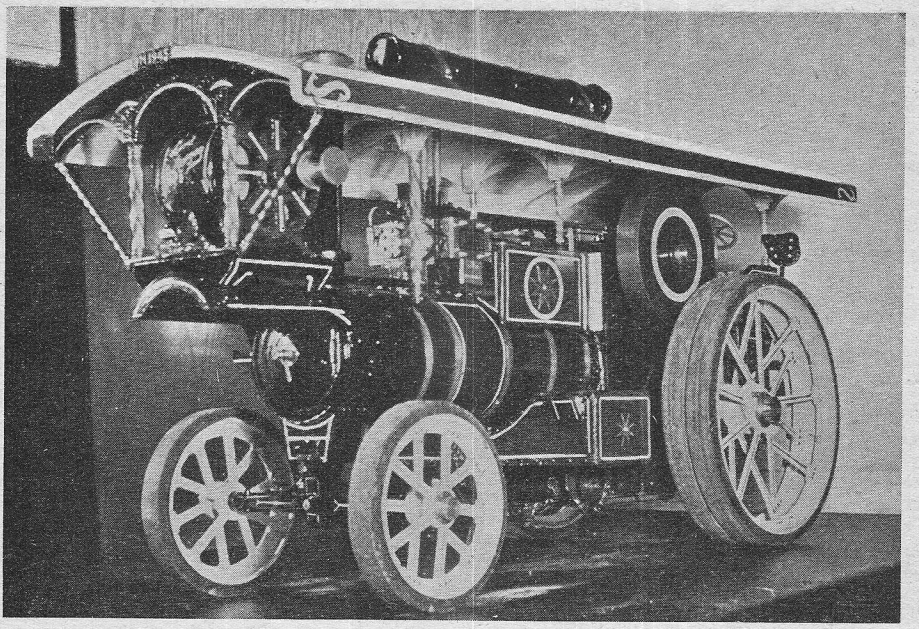
The cylinders are compound, the oiling being looked after by a mechanical lubricator, working off the offside expansion-link; link-motion, of course, being fitted. She is provided with two speeds, and as I have no provision for cutting gears, I have to obtain same by various ways and make them suit. The final drive is by roller-chain, the main spur having come off a lawn-mower; to the spur is now bolted the drum for the wire rope. The small sprocket on the countershaft I had to make, as I could not get one small enough. Feed pump off the crankshaft lifts water from the hind tank, which is also in communication with the saddle-tank under the boiler.

I have an injector under construction and this will be fitted shortly. A 12-14 volt D.C. generator is mounted on the dynamo saddle and is very efficient.

I run this engine at 90-100 lb. pressure, and she steams very well, indeed. With a nice fire going (and I don't get any trouble) as she seems to burn anything that looks like coal, with just a little persuasion from the blower. She looks very realistic on the road, and is a source of interest with passers by. I can't give her weight, as she has not been weighed, but she is 3 ft. 3 in. long, with front wheels $7\frac{1}{2}$ in. diameter, and rear $12\frac{1}{2}$ in. over the rubbers, roughly 2 in. scale.

No prints were used, but sketches as the job went on, and whilst I don't claim her as representing any prototype, I will say she has a strong





View showing the flywheel side of the model showman's traction engine

resemblance to the "Burrell," which happens to be my favourite, and I have tried my best to keep her in proportion, for as far as I'm concerned, no matter how good the workmanship is, if a model is out of proportion, especially a road engine. it is an eyesore.

I am indebted to friends for their help, namely : Mr. W. Clyburn for his share in turning some of the larger parts ; and to Mr. H. S. Watson for the photographs.

Woodworking Saws

(*Continued from page* 337)

If "second-hand" wood is being sawn, examine it carefully for concealed nails or screws *before* sawing—when the saw is heard to scrape on one, it's too late !

A candle-end rubbed on the blade will greatly ease the work of sawing, and will not mark the wood, though where the latter is damp, or even wet, oil may be preferable. (In passing, I may remark that planing wood may be eased by rubbing a candle-end on the sole of the plane, be it wood or metal.) An oiled felt pad is useful for this purpose, and also for oiling the saw, chisels, etc., after use where dampness in the workshop renders this desirable.

If saws are to be carried about, or may be damaged in contact with other tools, the teeth should be guarded by a grooved strip of wood, which may be tied on with string. And, of course, replace your saw in its proper place after use ; *don't* lay it down on the bench where it *will* come in contact with other tools.

Little attentions like these will ensure a long, trouble-free life to a saw, and will result in more pleasant work with less hard thoughts.

But particularly look after the teeth.

Sharpening a Bread Saw

Although, strictly speaking, this scarcely comes in the category of workshop equipment, it is one of those little jobs which can be useful in appeasing the wrath, real, anticipated or imaginary, of the domestic gods, and it can be done in a few minutes, in spite of the fact that most hardware dealers will say it can't be done at all.

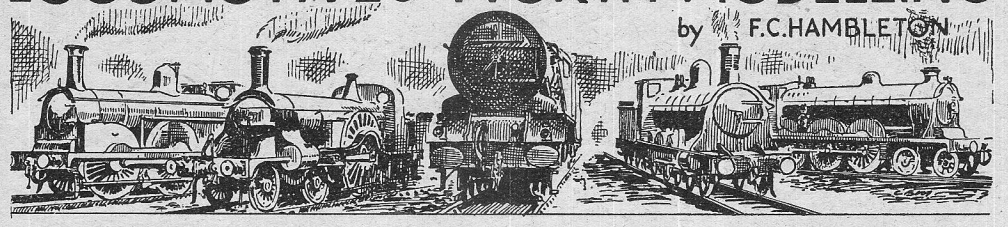
This is my method. A piece of 1-in. × 1½-in. wood was gripped in the metalwork vice, and two small G-cramps clamped the blade down to the wood, the handle overhanging the end, of course, and the edge of the blade just overhanging the edge of the wood. As the sharpening proceeded it was necessary to move the G-cramps about as and when they got in the way of the file.

A smooth-cut 4-in. half-round file was used, since at the moment a triangular file of that size was not available, and after a careful examination of the direction in which the teeth were cut, a start was made. (See Fig. 10.)

In my particular saw there are five sets of teeth ; all the teeth in one set are filed in the same direction, but the next set are filed in opposition, so that three sets cut on the forward stroke and two on the backward stroke. *All* the teeth are filed from the same side of the blade, however. Figs. 11 (a) and 11 (b) show the teeth before and after sharpening respectively.

LOCOMOTIVES WORTH MODELLING

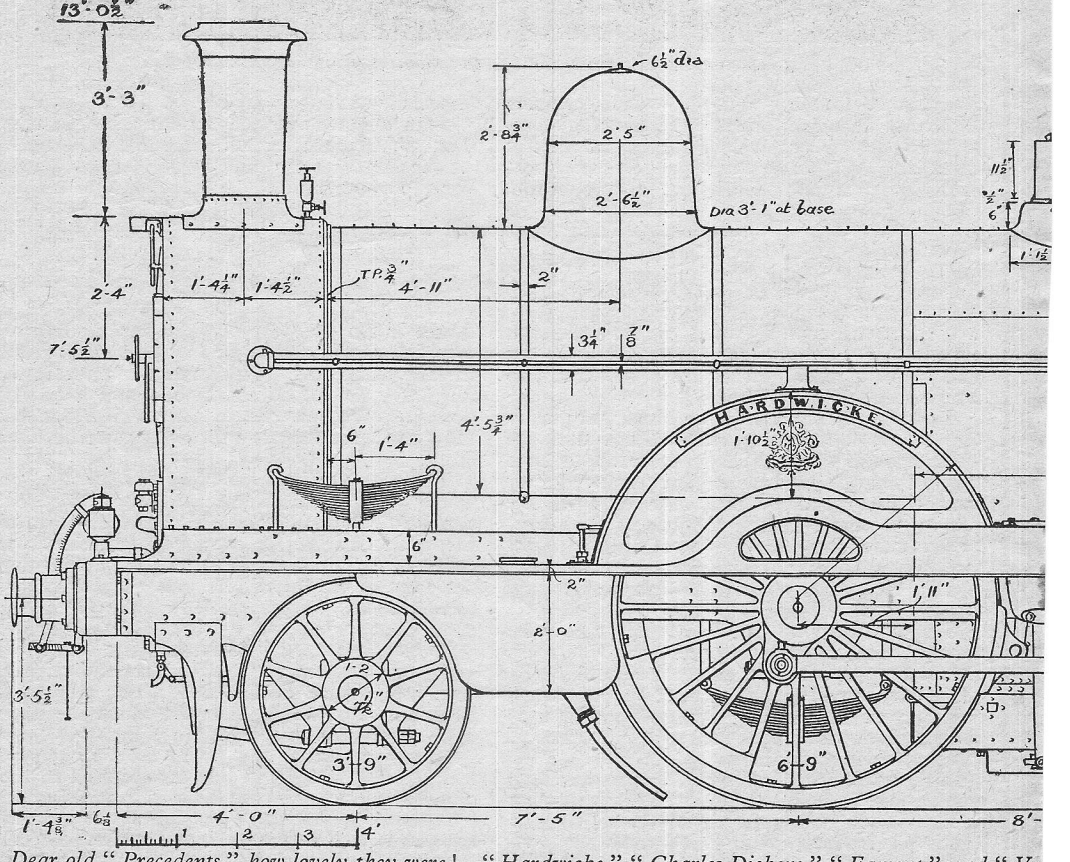
by F.C.HAMBLETON



No. 12—L.N.W.R. "Hardwicke"

SO many of my good loco.-modeller friends have asked me to include either the L.N.W. engine *Hardwicke* or *Charles Dickens* in this series, that I feel an apology for reverting once more to the "North Western" is hardly necessary. It would be waste of time to sing the praises of the famous 166 engines which comprised the "Precedent" class, so by way of introduction, I should like to give a short account of their origin—especially as there often seems to exist a slight confusion of ideas on this subject. In December, 1874, F. W. Webb turned out from Crewe Works the first express passenger engine which was entirely from his own designs. She was No. 2175, *Precedent*, and she was followed by 69 sisters, the last of which, No. 955, *Charles Dickens*, was completed by February, 1882.

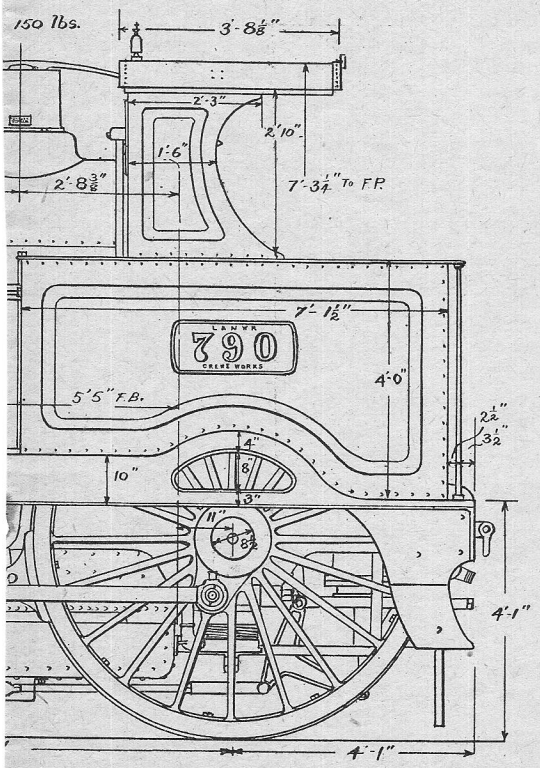
These 70 engines were an interesting example of things "old and new"; there was much of the traditional L.N.W. detail in them, but also much that was fresh to Crewe practice. Allan's



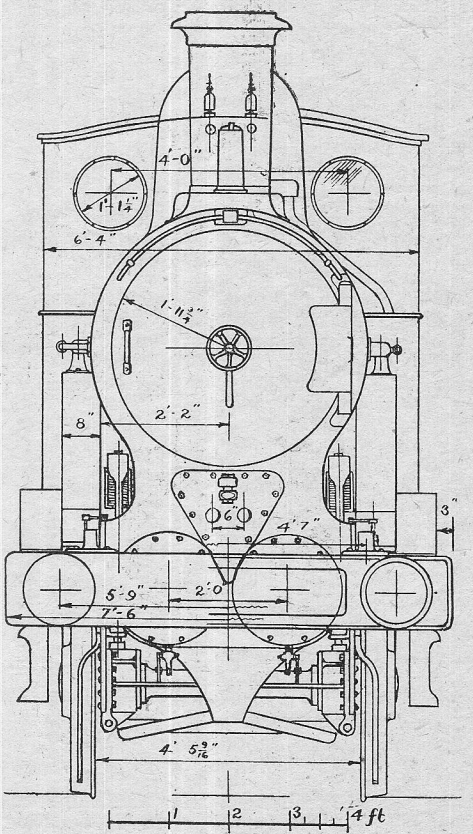
Dear old "Precedents," how lovely they were! "Hardwicke," "Charles Dickens," "Eamont" and "Vu

straight-link valve motion, vee-shaped steam chests with inclined slide-valves, a cylindrical regulator-valve situated in the smokebox, and a modified form of Ramsbottom safety-valve were amongst the novelties. The engines were a great success, they ran like greyhounds, and pulled like elephants (indeed, later on, they were dubbed " the Jumbos "), and their designer attributed these two virtues to the fact that their exhaust passages were so direct and free. It was not long before more of the class appeared. In 1887 a new batch, headed by No. 271, *Minotaur*, appeared, and no less than 96 engines in this series were completed by the year 1894, No. 2005, *Lynx*, being the last of this group, which also included the famous No. 790, *Hardwicke*, built in April, 1892. These 96 new locomotives were given the numbers and names of 96 old 2-4-0 Ramsbottom *Newton* class engines of a totally different design, which were scrapped at that period, but—shades of modern economy !—most of the old brass name-plates were put on the new engines, after having been stamped with the word " rebuilt " and the new date ! Could anything have been more misleading to the locomotive historian ?

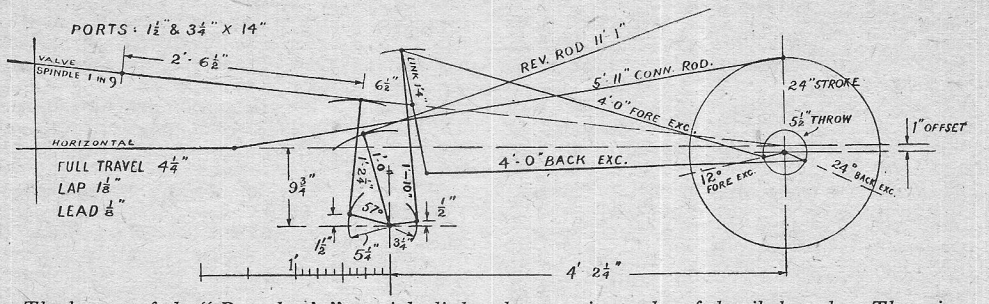
The 166 " Precedents," built, as I have just mentioned, between 1874 and 1894, did most of the first-class L.N.W. work for years, and naturally, in course of time, received new boilers ; often new frames, as well as odd details from time to time to keep them thoroughly up-to-date. Thus the 1874-82 engines went through six phases, the 1887-94 set likewise sharing in the last three of these " states." This, of course, really only relates to details. Such changes often happened in the history of a class of locomotive, but our problem is : which phase of the Jumbos shall we choose ? Largely a matter of personal fancy, of course, but I am going to plump for " phase 5," because it was in this state that *Hardwicke* ran her memorable " Race to the North," on August 22nd, 1895. How did she appear then as regards details ? Let us have a quiet look at the beautiful little engine. Rather severe in her lovely black paint gleaming in the sunshine ! We note the absence of a steam-pipe lubricator on the smokebox side, but see the polished brass one at the base of the chimney. This fed to the regulator valve. Below the circular smokebox door she had a snifting valve placed about the valve spindle guides. Just to the right-hand of the screw-coupling hook, and mounted on the buffer-



an " were perhaps the most famous of the gallant 166

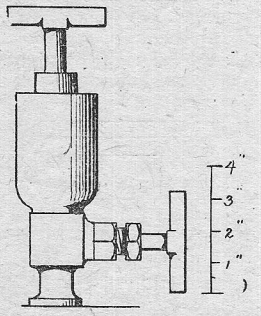


A front elevation shows the smokebox hopper, as well as giving a good idea of the fine proportions of the famous " Precedents "



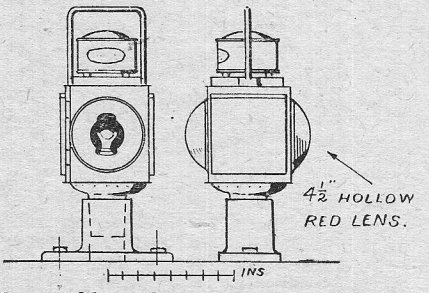
The layout of the "Precedent's" straight-link valve-gear is worthy of detailed study. The 1-in. offset was a curious feature, also used by Stirling in his "eight-footers"

beam was the very short vacuum brake hosepipe —the one with the pipe curved at the bottom, and not the cast-iron bracket pattern of later on. Only two lamp sockets on the buffer-beam—one near each end, and not over the buffers. These supported those charming, but ineffective,



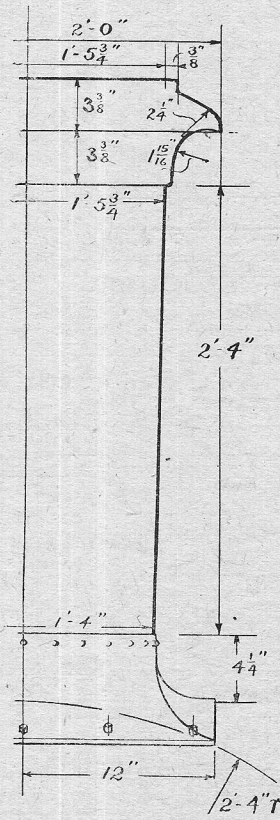
The polished brass regulator-valve lubricator, mounted at the base of the chimney, was an attractive little feature

Webb headlamps, fitted with white and red hollow lenses back and front. They gave a poor light, often blew out (but then, which design of headlamp doesn't blow out?) and they wouldn't stand up if out of their sockets! But



One could see the actual flame through the clear glass of "Hardwicke's" charming headlamps. The double-cone reflector was also a nice example of the skill of the coppersmith

they were delightful things to look at, all the same. (What an incurable L.N.W. enthusiast the man is, to be sure!). So *Hardwicke* screamed her way to Carlisle on that celebrated night, two white lights showing in front, and their reds gleaming to the rear. She had the trim little 3⅛-in. by 1½-in. coupling-rods then, painted entirely black except for the polished circular ends. Extraordinarily light these rods seemed for such heavy and fast work as fell to the lot of the Jumbos, and on a 12-in. throw, too! Some



The Webb chimney-cap had the unusual refinement of an undercut moulding with a radius of 1 15/16 in.

two years later they were supplanted by 4-in. fluted polished steel rods of much heavier section. Two whistles on the cab-roof, the right-hand one being the passengers' alarm, actuated by the roof-cord threaded through the

two little davits on the tender. Cab roof black, and no coal-rails round the tender. The hand-rails were attached to the vacuum-brake ejector pipe, and were placed at the centre-line of the boiler, 7 ft. 5½ in. above the rails. (The 1874-82 engines originally had the hand-rails 8 in. higher than this.)

The blower-valve, actuated by rotating the right-hand or fireman's hand-rail, was placed on the right-hand side of the smokebox. The front screw-coupling no longer had an arm with bob-weight at its end to facilitate tightening-up. Instead, the screw spindle was bored to receive a turning-rod, ⅞ in. diameter by 12 in. length, which was prevented from falling out by a little knob at one end and a hexagonal nut at the other. This completes most of the external details belonging to "phase 5." The painting was standard L.N.W., already described in these columns.

And now, finally, a word or two about some of the outstanding mechanical features common to all the class in their hey-day. The cylinder centre-line (horizontal) and the valve centre-line (inclined) were both offset one inch above the driving-axle centre. This gave some odd angles of advance to the eccentrics. When pulled up in mid-gear, the die-block was not in the centre of the straight expansion-link. Owing to there being arms on both sides of the under-hung weighbar-shaft the valve-gear was virtually self-balancing. Consequently, no balance-weights or springs were necessary. Indeed, the reversing wheel was not even given a securing catch, the fine thread on the screw spindle taking all the fore and back thrust! When the engine was in full fore gear the screw spindle projected backwards beyond the reversing wheel itself. To pull up in to full back gear required 10 anti-clockwise turns of the wheel. There was no indicator to show the percentage of cut-off being employed; one merely relied on the number of turns one gave to the wheel when notching up, and on the "feel" of the running of the engine. A very interesting feature was the hopper, with its 6-in. by 2-in. opening, placed below the smokebox. This allowed direct access of air from below the cylinders, straight up through the smokebox, and up the chimney! There was no provision for closing this opening. And what about destroying the smokebox vacuum? Well, these Webb boilers steamed like demons, although, when running fast, the showers of sparks, urged upwards by the exhaust steam discharging through a 4¾-in. blast-pipe, were quite equal to the finest firework display! The ashes that fell downwards through the hopper mouth were stopped from reaching the leading axleboxes by a plate, slightly inclined downwards, which stretched from above the hopper mouth to the leading horns. The ash-pan had one damper, placed at the front end.

The boilers worked at 150 lb., and the safety-valves were Webb's modification of the well-known Ramsbottom type. The main body of the valve was a single casting, and the spring, instead of being in tension, as heretofore, was now arranged in compression. Being completely enclosed, it was quite impossible to tamper with it, and the trial-release lever was given a pleasing curve. The cab-fittings and the wooden-framed tenders presented so many points of interest that they demand a separate notice. These, then, were the main features of these lovely engines. How fortunate it is that *Hardwicke* herself has been preserved—for ever, let us hope!

The Birmingham S. of M.E. Exhibition

OUR first post-war exhibition proved a great success and the many members and friends expressed satisfaction with the exhibits. The judges were Messrs. E. T. Westbury, G. Hastings and N. S. Hicholas, and awarded the "Lehmann Cup" to Mr. D. M. Picknell for his 3½-in. gauge "Princess Marina." The other prizes went to Messrs. F. A. Pariser—model clipper "Cutty Sark"; P. Thompson—group of accessories for 3½-in. Myford lathe; T. Dalziel—15-c.c. two-stroke and patterns; S. Jones—3½-in. gauge locomotive "Molly," and A. E. Phillips—1-in. scale Fowler road locomotive (a photograph of which appeared on the cover of THE MODEL ENGINEER of January 31st, 1946).

There was a great variety of work and the standard was high, making it difficult to single out any particular exhibit. Nevertheless, one feels that certain models in the loan section cannot be omitted. A 3½-in. gauge "Royal Scot" (less tender) made by Jack Horton would appear to be about the best model of this engine yet seen, it being a faithful reproduction and the workmanship faultless. The 3½-in. gauge free-lance 4-6-2 locomotive built to American loading gauge by Mr. A. W. Sarsons, was another exhibit of outstanding merit, and Mr. Finch's "Rainhill" also showed perfect workmanship.

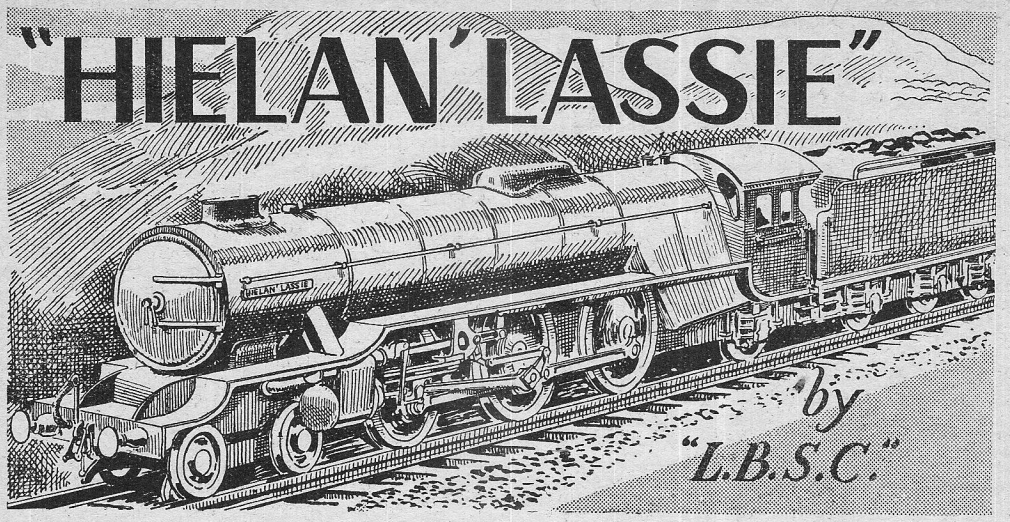
A rather unusual exhibit was some wood-carving shown by Mr. K. R. Whiston. This is most difficult to describe—being carved from a cylinder of wood, the result being three inter-locking, frail, hollowed-out bird outlines, of little more than pencil thickness. When set in its correct position, a triangular stand was formed. Mr. Whiston also showed an ingenious fishing-reel, two cigarette-lighters (one being 9/32 in. diameter by 1 in. long) and a division-plate, all of these obviously being the work of a good craftsman.

Mr. Lockley's motor-boat *Sunny Jim* and Mr. Judd's electric drifter *Girl Pat* were beautifully finished models. Mr. Lockley also showed his versatility with an "O" gauge "Mollyette" and a 2½-in. gauge 4-4-2 chassis, the workmanship and finish of which were akin to his boat.

Mr. J. D. Campbell's MODEL ENGINEER road roller (unfinished) was a beautiful piece of work, and one thinks Mr. Westbury must have given it more than a passing glance! It should be a fine model when completed.

Our only regret over the whole event is that owing to the lack of a hall we had to limit the exhibition to members and their families, with a few visitors from other local societies.

"HIELAN' LASSIE"



THE inside cylinder for this engine is much the same as the one I specified for "Olympiade" back in 1938, only a bit larger. It is very easy to machine and fit up, and is held in place between the frames by six screws at each side, running into tapped holes in the flanges. Incidentally, the fact that I specified No. 21 screw-holes for the inside cylinder, and $\frac{3}{16}$-in. for the outside ditto, worried some of our beginner friends; in fact, one was so sure I had made a mistake, that he wrote and told me he had drilled the whole lot $\frac{3}{16}$-in. None of them seemed to realise that there are twelve screws to hold the inside cylinder, against six for the outside, so the former doesn't need such big screws. It will be noticed that there is a web at one side, bridging the space between the fixing flanges, and this is for the exhaust way; the exhaust pipe will be attached to it by an oval flange held with two screws, the other end entering the base of a casting forming the lower part of the twin blastpipe arrangement. There is nothing special about the rest of the cylinder, which is as simple as the ready-bored specimen in the one-and-ninepenny stationary engine set, that Curly bought when he had his long curls, in the happy days of long ago.

How to Machine the Casting

First check off the position of the core-hole; if it is centrally situated between the sides, you needn't bother about any marking-out. I don't, or perhaps I ought to say the fairies at the bottom of my garden don't, for I'm not supposed to do any work myself. Anyway, if it isn't central, file off any superfluous knobs and excrescences that happen to adorn the end of the casting, brush a little marking-out fluid over it (if you have any) and put a wood plug in the core-hole. Mark the true centre on the plug; and from it, scribe a circle $1\frac{3}{16}$-in. diameter, as shown in the sectional illustration, with a pair of dividers. The portface should also be smoothed off, as it must make good contact with the angle-plate whilst the cylinder is being bored.

The method of mounting and boring inside cylinders, was fully described and illustrated in the "Petrolea" serial; and all beginners and inexperienced lathe workers should carefully read, mark, learn and inwardly digest the instructions given. Those, in conjunction with the following brief outline of how to tackle this particular casting, should enable them to make a good job of it. You need a 4-in. by 3-in. or larger angle-plate, which is bolted to the lathe face-plate, and the cylinder casting mounted on it, port-face down, one end overhanging slightly. Set the core-hole—or the marked circle, as the case may be—to run truly; and set the casting parallel with the lathe bed, checking with a try-square, stock to face-plate, and blade to one of the sides of the casting, which is fixed to the angle-plate by a bar across its back, and a bolt at either end of the bar. Personally, I use a Keats vee-angle-plate, simply dropping the casting into the vee, tightening the clamp, and adjusting the angle-plate on the face-plate until the core-hole or marked circle runs truly to a scribing-block needle, if large; for a small one, I just run the tailstock centre up, which gives the right adjustment in half a jiffy. The angle-plate bolts are then tightened, and we proceed to bore.

Put a round-nose tool crosswise in the rest, and take a cut off the end of the casting; if the lathe vibrates, bolt a balance weight of some sort (couple of change wheels will sometimes do the trick) opposite the angle-plate, to counterbalance it, otherwise you won't get a true bore. Then put an ordinary boring-tool in the rest, and take a cut through the core-hole, deep enough to shift all the hard skin. Most beginners make the error of running the lathe too fast on this job, and not only create a "gauge O" earthquake, but lose the edge off the boring-tool before penetrating a quarter through the casting. Slow speed with a carbon-steel tool, medium speed with a high-speed tool, plus steady feed, does the trick. If your lathe has a self-act, use it; if not, turn the topslide or lead screw handle very steadily. I explained in the "Petrolea" notes, how to set the topslide true for cylinder boring. If you are the lucky possessor of a $1\frac{3}{16}$-in. parallel reamer, open out the bore until the "lead" on the end of the reamer will just enter;

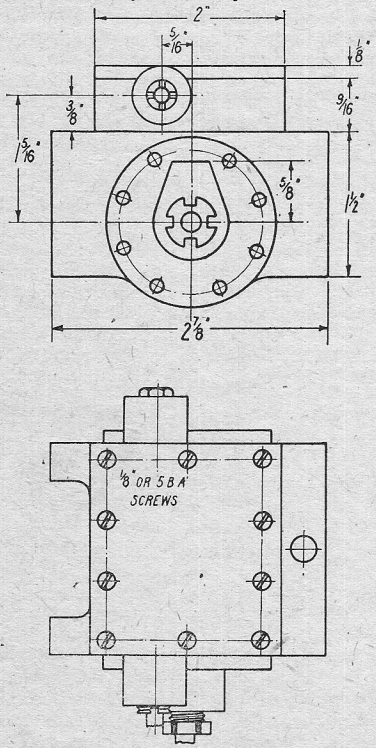
only a thousandth or two should be left for the reamer to take out. Beginners should remember it is a truing-up and finishing tool only, not a boring-tool. Unless your lathe is a good big one, it is no good attempting to ream the bore in the angle-plate; the reamer would not pass through. However, some types of lathes of 5-in. centre and over, have a mandrel with a very big hole in it; and if the hole is big enough to let the reamer enter, you can go ahead as previously described for smaller cylinders. Put a carrier on the reamer shank, hold it against the tailstock centre, and push the reamer through the bore, with the lathe running at medium speed, by sliding the tailstock bodily along the bed, stopping only to reverse.

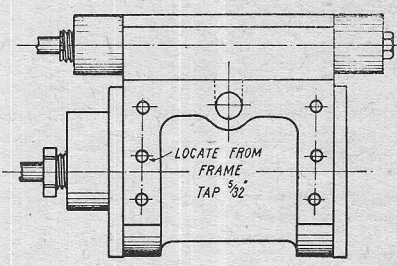
If you haven't a reamer, bore out to within 1/64 in. of finished size; then re-grind the tool, finish to size, and go two or three times through the bore without shifting the cross-slide. This will counteract any tendency of the bore to become untrue, due to springing of the tool. Take a final skim off the end of the casting, to remove any burring.

To face the other end, chuck a stub of brass in the three-jaw, and turn it until the cylinder can be pushed on very tightly; the unturned end can then be faced off to length with a round-nose tool used crosswise. Reamer owners whose lathes were not big enough to allow its use, can now grip the casting in the bench vice, and carefully put the reamer through by aid of a big tapwrench. A drop of cutting oil on the reamer helps to get a true smooth bore. Let the reamer "go its own way," in a manner of speaking; don't try to force it, or it will run to one side and you won't get a true hole. Some of the defective commercial cylinders I re-conditioned, were trued up simply by putting an expanding reamer through the bores, as described above; I found it ever so much quicker than setting up the cylinders in the lathe, and re-boring them.

Port-face and Sides

The port-face and side flanges can be machined up on the lathe as easily as in a milling-machine. Simply up-end the casting on the angle-plate, and fix it with a bolt through the bore, using a washer under the nut which is bigger than the bore. I make special brass washers about $\frac{1}{4}$ in. thick, for jobs like these, the holes being drilled to suit the bolt. Set the port-face parallel with face-plate, by checking the side of the casting with a try-square, stock to face-plate and blade to side; hold it against one of the flanges. Set the angle-plate so that the casting runs as near the middle of the face-plate as possible; then with a round-nose tool set crosswise, set about the casting until you have turned enough off the port-face to bring it within 11/32 in. of the bore. Slew the casting around a quarter turn, set truly again with try-square, stock against face-plate, and blade to the machined port-face; then take a cut off the side flanges until they are 27/32 in. from the bore. Measure with a slide-gauge. Slew once more, a complete half-turn this time; "ditto repeato" on the remaining flanges, and your casting should now measure exactly $2\frac{7}{8}$ in. over the side flanges, besides being dead true and square all ways. Terribly difficult job, isn't it?





End, side and top of inside cylinder

Ports and Passageways

The dimensions of the ports will probably cause the members of the S.P.S.B.P.P. to seek solace in a " double methylated " ! They can be machined on the lathe, same as described for " Petrolea," either by mounting the casting on an angle-plate attached to a vertical slide, or mounting it on the top-slide direct, with suitable packing to bring the location of the ports level with lathe centres. Users of 4-in. Drummond lathes have a big laugh here, as they can adjust the height of the saddle and cross-slide to suit. I wonder why on earth other manufacturers who claim to be so keen on " improvements," don't incorporate such a useful feature in their products ; it was included in my proposed universal machine for locomotive builders. Anyway, give the port-face a coat of marking-out-fluid, if you have any, and set out the ports as shown in the accompanying illustration. If you endmill them, the ends will be rounded, instead of being square as shown ; leave them thus, as it doesn't matter a Continental whether they are round or square. What *does* matter, is that the edges should be straight, and not looking as though Walt Disney's famous rodent had been operating on them with his teeth. Use an end-mill or slot-drill in the three-jaw, the correct width to clean out the slots to correct size without adjustment ; I prefer home-made slot-drills, as they get rid of the chippings much more quickly than regular end-mills. Have the ports all the same length, which can be done by turning the cross-slide handle the same number of times for each port ; alternatively, it isn't a very difficult job to rig up a stop to clamp over the ways of the cross-slide. Before I had a regular vertical milling machine, I used to clamp a bit of flat strip to the cross-slide. by a bolt in one of the T-slots, and bend the end over so that it gave the " whoa " signal by touching the edge of the lathe-bed.

Ports can be cut easily enough by hand, provided the job isn't attempted after a convivial evening at the " Dewdrop Inn." Drill a row of holes about $\frac{3}{16}$-in. deep, down the middle of the marked-out space, and a shade less in diameter than the port width. Chip them into a slot with two little chisels, one made from $\frac{1}{8}$-in. steel for the ends, and the other made from $\frac{3}{8}$-in. steel for the sides. It only requires care ; young Curly chipped out many a set in his early days, and still does, in certain circumstances, e.g. enlarging the ports on the rebuilt " Cock-o'-the-North." It was far quicker than setting up the job and machining them. Although I have the equipment for doing plenty of machining, the old urge to do a bit of hand-work still persists ; in fact, I often feel like getting a cocoa-tin and turning it into a toy steam engine, becoming in spirit for an hour or so, the poverty-stricken but happy kid of about three-score years ago.

The passageways between ports and bore, consist of three No. 30 holes drilled at an angle, as shown in the sectional illustration. For beginners' benefit I might here remark that, just as it is a bad mistake to have the ports too small, it is just as bad to have the passageways too big. The reason is obvious to anybody who spares a moment's thought. The passageways have to be filled with steam at boiler pressure, at every stroke, and this steam does no useful work, but is merely blown to waste when the exhaust port opens. Those people who have derided the fact that my ports exceed the passageways in area, always overlooked a vital fact, viz., *that the passageways are always full open*, whereas when the engine is running notched up, the ports are only cracking, and exposing much less area than the area of the passageways. The reason for the long ports, is that for maximum efficiency you want to get the steam to the piston-head at full pressure as the crank passes dead centre ; therefore the port must give as big an opening as possible in the shortest possible time. " Lassie's " ports will pass as much steam when they are just cracking, as the average commercial engine's ports when wide open.

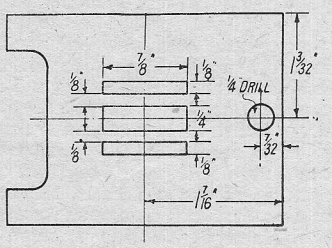
If you have a drilling-machine, make three centre-pops on the end of the cylinder flange, close to the bore, and set the casting end-up in the machine-vice, at such an angle that the drill makes a bee-line for the bottom of the port. You can " sight " this angle easily enough by letting the drill come down *outside* the casting, adjusting the latter in the machine vice until the drill lines up with the bottom of the port. Also, the following tip is worth repeating, for beginners' benefit especially ; use a drill ground slightly off-centre, so that it cuts a bigger hole than its own diameter. If you are unlucky, and manage to break it in the hole, the bits can be shaken out, and the casting isn't wasted ; all you lose is the price of a new drill, and even that can be chalked off as " experience bought and paid for." If you haven't a drilling-machine, do the job by hand ; it is handier than the lathe in this case. Simply catch the casting in the bench vice at such an angle that if you hold a hand-brace to it horizontally, the drill will hit the bottom of the port. Then go ahead and drill, but be careful when you break into the port, because that is the fatal spot where drills catch up and " go west." File a little bevel at the edge of the bore, across the three " entrances to the way out," so that steam can get freely between passageways and bore when the covers are on.

The cylinder casting is arranged so that the exhaust-way can be drilled in it, and provided with a vertical outlet for easy connection to the base of the twin blastpipes. Centre-pop the boss provided, and drill straight in with $\frac{1}{4}$-in. drill until it meets the exhaust-port ; see section through cylinder at that point. Any sharp edges can be removed with the small port chisel mentioned above, so as to give the exhaust steam an easy exit. Directly above this hole, and 7/32 in. from the edge of the casting, drill a vertical $\frac{1}{4}$-in. hole to meet the horizontal one ; then tap the end of the latter 9/32 in. by 40, and screw a plug in, filing same flush with the side of the casting, and taking care it doesn't obstruct the vertical hole.

Cylinder Covers

There is nothing special to note about the cylinder covers, which are machined up in the same way as described for " Petrolea " and other engines in this series. The front cover is a plain turning job, needing no detailing out ; the register that enters the cylinder bore need only

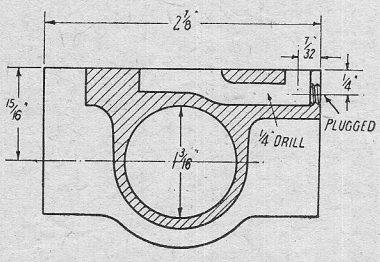
project 1/64 in. beyond the flange. The one on the back cover should be the same thickness, but be sure it is an exact fit in the cylinder-bore, as it locates the cover and is responsible for the piston-rod being central. After turning register and flange, and turning the cover to $1\frac{3}{4}$ in. diameter, centre it and put a $\frac{3}{16}$-in. drill right through the lot, chucking piece and all. Then saw off the chucking-piece, and rechuck the cover the other way about, either gripping



Port-face of inside cylinder

carefully by the edge in the three-jaw, or else making a stepped ring to hold it, as I have described when dealing with other engines. Open out the central hole with an 11/32-in. pin-drill having a $\frac{3}{16}$-in. pilot pin; this ensures the gland being absolutely concentric, and allowing perfect freedom of the piston-rod in any position of the gland. Tap $\frac{3}{8}$-in. by 32 using tail-stock chuck to guide the tap, for same reason. Face off the boss to a length of $\frac{7}{16}$ in. from the cover, as shown, and mill or file the flat top of same to a distance of $\frac{5}{8}$ in. from the centre of piston-rod hole.

Might I here impress on all beginners, the importance of having all moving parts accurately fitted, so that the engine has all its power available to pull a load, and not a big percentage of it mopped up in overcoming the friction of its own parts. A gland drilled slightly eccentric, will bind on the piston-rod and first absorb useful

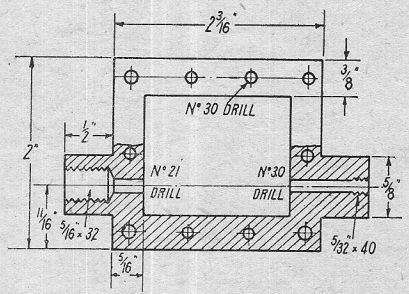


Cross-section of inside cylinder through exhaust-port

power, then cause bad wear, and finally develop leaks and blows. A locomotive with too tightly packed pistons and glands, slightly out of line, will haul far less with 120 lb. of steam in the boiler, than a properly-fitted one with 60 lb., and use about three times the amount of coal and water in addition. How do I know? Well, I've built quite a lot of locomotives, and reconditioned quite a few that other people have built; and experience still teaches! Any engine should be able to coast quite a long way with steam off, and run freely if given a push, yet it should not blow at pistons or glands; it will then run with the utmost power and economy. The other afternoon, my L.N.W.R. tank engine "Olga" hauled me at a high speed for 35 minutes without my touching the fire; the injector was put on twice during the run, and that was the only time the firehole door was shut. "Hielan' Lassie" should be able to beat that easily with a far greater load.

The piston gland is turned from a bit of $\frac{1}{2}$-in. bronze rod held in the three-jaw, and being completely machined at the one setting, there shouldn't be much chance of it being untrue. Face the rod, centre, and drill it for a depth of $\frac{5}{8}$ in. with a No. 14 drill, then turn down the outside for $\frac{3}{8}$ in. length to $\frac{3}{8}$ in. diameter, and screw $\frac{3}{8}$ in. by 32. Part off at $\frac{1}{2}$ in. from the end, put in the four C-spanner nicks by milling, planing or filing (the slotting blade of an Eclipse 4S tool does this very well) then screw the gland into the stuffing-box and poke a $\frac{3}{16}$-in. reamer through the lot. The gland should turn freely whilst the reamer is in position.

Each cover is attached by eight $\frac{1}{8}$-in. or 5-B.A.



Inside steam-chest

screws. Scribe a circle around the middle of the flange, and set out the position of the screwholes on it as indicated in the illustrations, not forgetting to space two of them far enough apart to clear the passageways, when the cover is in position. Drill the holes No. 30. The front cover can be set in any position, subject to above condition, but the back cover must be arranged so that the guide-bar seat over the gland is exactly horizontal. This is easily done. Put the cover temporarily in place and set it "by eye"—the register should fit the bore tight enough to keep the cover from falling off—and lay the casting on its side on the lathe bed, or any other true surface. Apply a try-square to it, with the stock resting on the flat surface, and adjust the cover until the guide-bar seat lies truly against the blade. Use the covers as jigs for setting out the screwholes in the cylinder flanges, running the No. 30 drill through the holes, to make countersinks on the cylinder flanges. Drill them out No. 40, and tap $\frac{1}{8}$-in. or 5-B.A. If one hole is drilled and tapped first, a screw in it will hold the cover in place whilst locating all the rest.

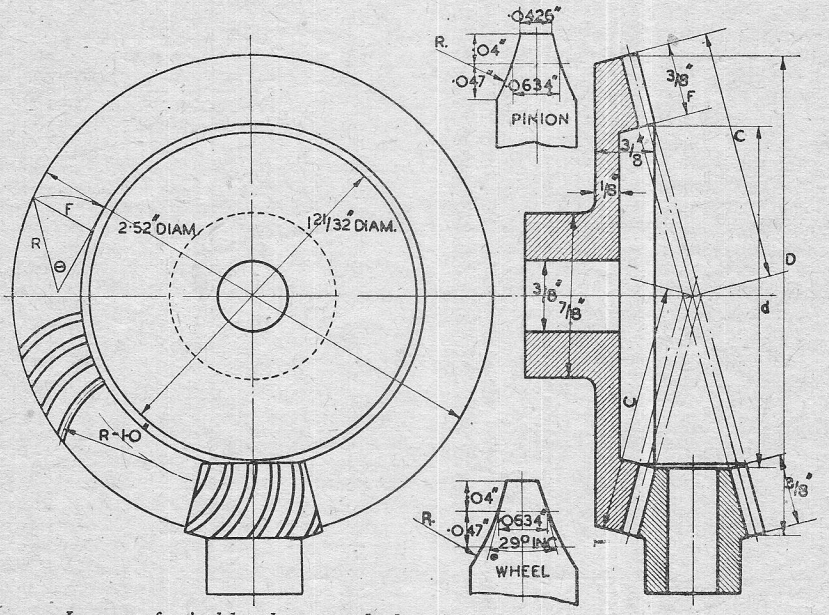
Cutting Spiral Bevel Gears

By W. F. WADDINGHAM

A builder of the "M.E." Road Roller makes special cutters for producing an unusual gearing

DURING the construction of an "M.E." Road Roller, it was decided to use spiral bevel gears in the transmission box, and the following is a brief description of their design and manufacture.

The shape of tooth decided upon is unusual in full-scale practice, in that the tooth is radial at the small end. The teeth are cut on the constant-depth principle and the angle at the large end of the tooth is chosen so as to make the circumferential tooth thickness on the pitch-line equal to the space between teeth. Thus the proportions of the teeth are correct at both ends. The teeth are of constant radius and the spaces are milled out by means of fly-cutters mounted in the end of a suitable cutter-head. The radius of the fly-cutters can be calculated from the attached formulae, or found from an enlarged scale drawing.



Layout of spiral bevel crown-wheel and pinion for "M.E." road roller

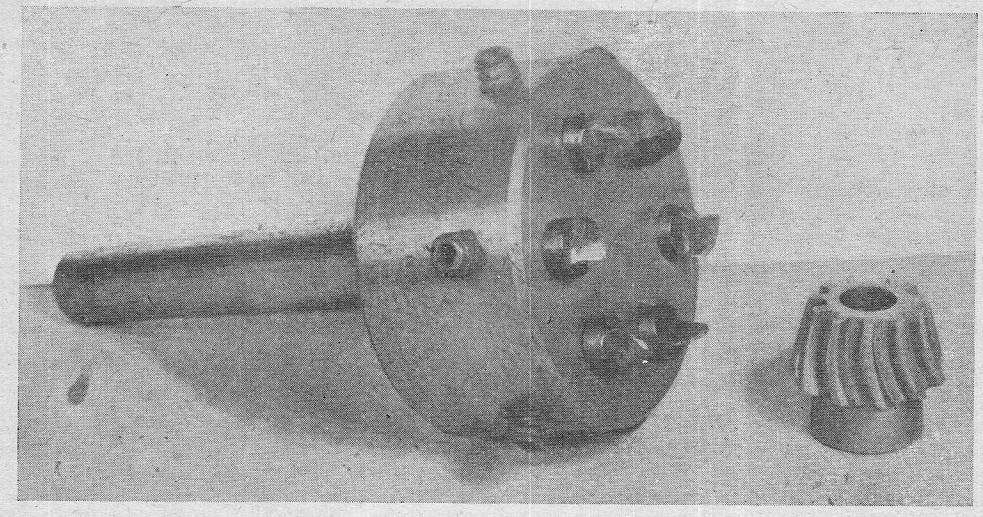
The cutters for cutting the wheel are straight-sided, but the set used for cutting the pinion are curved, the actual shape being drawn out ten times full size, and the radius at the shoulder of the cutter calculated from a formula given by a correspondent in THE MODEL ENGINEER. In this particular instance, the cutter-head and taper shank was turned up from a 3 in. × 1¼ in. diameter Whitworth bolt, and six ⅜ in. holes drilled and reamed on a 1-in. pitch circle. Cross holes for set-screws were drilled and tapped ⅜-in. Whitworth to secure the cutters. The cutters themselves are short lengths of ¼ in. diameter tool-steel turned down to ⅜ in. to fit tightly in the holes in the cutter-head.

The cutter-head was then mounted in the lathe and, by turning each piece of tool-steel round its socket, the various cutting and clearance angles can be formed by ordinary turning methods. The cutters and holes in the head are numbered so that, after hardening and tempering, each cutter can be replaced in its own hole.

The setting of the cutters in the head calls for some care, but a certain amount of adjustment can be obtained by rotating a cutter slightly in its hole to make it cut on the same radius as the remainder. After turning the pinion blank, the completed cutter is mounted in a drilling-spindle on the top-slide and presented to the blank in such a position that the tooth space to be cut will be radial at the small end, and the angle of the cutter is adjusted so that the teeth first scrape the blank at the centre of the face.

After cutting to the full depth, it may happen that the teeth at the large end are more rounded on one side than the other, and this can be corrected by resetting the cutter-head to trim off the teeth where necessary.

Cutting the wheel is rather easier than the pinion, and is carried out by the same method with a straight-sided set of cutters with an



The inserted-tooth cutter and one of the pinions cut with it

included angle of 29 degrees. This cutter, of course, produces a straight-sided tooth; but, provided the number of teeth is fairly large, the necessary amount of rounding can be carried out by hand with a fine file when removing burrs left by the cutter. The chief difficulty in cutting wheels by this method is the problem of setting the milling-head to the correct angles. The teeth of the wheel must curve in the opposite direction to those of the pinion in order that the pair shall mate.

The first pinion was cut in brass to see if the system worked; the result was a failure, as the teeth are inclined in one direction.

The pair of wheels now incorporated in the road roller transmission-box are 44/11 ratio, the wheel being 70/30 brass, and the pinion mild-steel. Before mounting in the gear-box the wheels were run together in the lathe and "lubricated" with a mixture of metal-polish and oil. A few minutes' running removed the tool-marks, and the pinion was then case-hardened.

The relation between the radius of the fly-cutter, the width of the tooth face and the diameter of the wheel or pinion, is found as follows:

Let ϕ = spiral angle at periphery. N = number of teeth. F = face width. C = centre distance. D = large pitch diameter. d = small pitch diameter. R = radius of cutter.

$$\text{Then } \cos\phi = \frac{\text{Normal pitch}}{\text{Actual pitch}}$$

$$\text{At outside, } N = \frac{2\pi D}{\text{Actual pitch}} = \frac{2\pi D\cos\phi}{\text{Normal pitch}}$$

$$\text{At inside, } N = \frac{2\pi d}{\text{Normal pitch.}}$$

$$\therefore 2\pi d = 2\pi D\cos\phi; \text{ or } \cos\phi = \frac{d}{D}$$

$$\text{But } \frac{d}{D} = \frac{C-F}{C} = \cos\phi, \text{ and } \sin\phi = \frac{F}{R}$$

$$\text{Now } \cos^2\phi + \sin^2\phi = 1$$

$$\therefore \left(\frac{C-F}{C}\right)^2 + \left(\frac{F}{R}\right)^2 = 1$$

$$\text{From which } F = \frac{2CR^2}{C^2 + R^2}$$

Model Aircraft Engine Construction Sets

We have received from Majesco Miniature Motors, 35, St. Floras Road, Littlehampton, Sussex, a sample set of parts for constructing the "Majesco 45" engine as recently described in "Petrol Engine Topics." The set comprises light alloy die castings for the cylinder, crankcase, endplate, transfer cover, contact-breaker, carburettor and connecting-rod; bar material for the piston, crankshaft, hub flange, etc.; a semi-finished cylinder liner; and all screws, nuts and other material necessary, including a pair of tungsten-tipped contacts. A detailed drawing and a sheet of instructions are enclosed with the set, which appears to be very good value for money, and capable, with due care in machining and fitting, of being made into an efficient model aircraft petrol engine.

Letters

A Model Winding Engine

DEAR SIR,—I noticed the little beam engine in THE MODEL ENGINEER for February 14th. My first and, I think, correct impression was that it was rather too massive in some parts, but on studying it more closely I saw that it was, in fact, a model of an old-style winding engine with two reels for use with flat ropes. I know of only one colliery that uses such a method, so it is obvious that the above-mentioned model is of some historic value. Could the exhibitor be persuaded to tell readers more about it and its prototype?

Yours faithfully,

Shipley. FRANK D. WOODALL.

Roundabout Engines

DEAR SIR,—I was very interested in the article on "Steam Horse" roundabouts, in the February 21st issue. Actually, these are the first details and pictures I have seen of a great favourite of mine.

There is a set of "Walker" gallopers and a set of "Tidman" ditto still going strong in this district, and I've seen quite a few sets of "Savage" recently. There used to be a set of horses in Leicester with an "Allchin," Northampton, engine, but I don't know if they built the machine as well. In 1916, my father built a model set with steam engine to drive it, the horses did not gallop, but the machine was a success.

However, in 1935 we scrapped the remains and built a new one; it has a "Tidman" type engine arranged in the centre, as per switchback, but the machine is a 36-horse, 3-abreast set of gallopers. The engine is coal-fired and both the main engine and the model which drives the organ (musical box) and the dummy figures on the front of the organ, have their own mechanical lubricators and water pumps.

Lighting is by 3.5-volt bulbs running off three mains transformer.

This model is about 4 ft. 6 in. in diameter, and is a great success, it has run 8 hrs. continuously at local shows, and attracts great attention. A photograph of this machine was reproduced in THE MODEL ENGINEER about 1937, but I have been unable to get any pictures of it under erection, as, of course, it "takes down" to remove to the site like a real one.

I hope we shall see more about these machines in the columns of THE MODEL ENGINEER.

Yours faithfully,

Leicester. R. TAYLOR.

Saddle-tank Drawings

DEAR SIR,—I have a desire to build another model locomotive (having finished "5XP" by "L.B.S.C."), this time a four-coupled industrial tank locomotive.

I have seen described in THE MODEL ENGINEER on two occasions the 5-in. gauge "Midge," and the model I have in mind is identical but having a saddle-tank instead of side tanks, and built in 2½-in. gauge.

My trouble is suitable blueprints or detailed drawings, as these are apparently unobtainable for a 2½-in. gauge model.

If any reader could help me to obtain any drawings or prints, I would be very pleased.

Yours faithfully,

Market Harborough. SGT. PATRICK, R.A.F.

Ciné Projector Design

DEAR SIR,—The letter, published in THE MODEL ENGINEER dated March 7th instant, from Mr. Moss, of Oldham, on Ciné Projector Design, has been perused with great interest by myself and a colleague. Much thought has been given by us to the adaption of a four slot Maltese cross intermittent movement to 9.5 and 16 mm., without success. I should be more than pleased if Mr. Moss would give further particulars of the intermittent movement which he is now designing and so help my colleague and self in designing our own projectors.

Yours faithfully,

London, E.6. A. C. S. MARSDEN.

Model Racing Cars

DEAR SIR,—I should be glad if you would allow me to reply to Mr. Cruickshank's letter in the February 28th issue; but, first, may I thank Mr. Pinnock, the chairman of the S.M.E.E., for his friendly words in "Smoke Rings" in the same issue.

I am very pleased to say, that what Mr. Pinnock advised, the formation of a general club instead of a Race Car Club only, has come to be an actual fact, by reason of the recommencement of activities by the North Staffs Models Society, which had been in temporary retirement during the war.

The miniature racing cars will become a section of this Society, and already, by means of one or two demonstrations of the cars in action, I have reason to believe that there will be another car or two built. This is a good start, and it is to be hoped that still more North Staffs model engineers will become members.

Being very pleased to know Mr. Cruickshank as a personal friend, and for whose work I have great admiration, I was, naturally, most interested in his letter.

I must admit that his opening paragraph "shook" me more than a little, for I have been trying to get him and some of his fellow members to pay a visit to the Potteries for some months now. We can occasionally arrange for the use of an indoor track with electric lighting and heating, and would be more than pleased to have the pleasure of their company any time. I believe, however, that they have some new motors nearing completion and it is quite understandable that they would wish to bring these to Stoke, which we sincerely hope they will.

Throughout our model car experiments and developments, we in Stoke have been severely handicapped by the lack of a track of our own on which we could hold regular meetings, and we have been almost completely unable to obtain more than two or three days' notice as to whether a track would be available. Even then, we have been unable to run when we arrived, as other gatherings had preference.

Obviously, such conditions were not con-

ducive to the arranging of demonstrations in order to capture the interest of possible members, and so we did not feel justified in forming a club of three.

On the other hand, the Pioneer Model Racing Car Club, including, of course, Mr. Cruickshank, have almost always had a track available (by kind permission of the Clerk of the Weather), and have been able to make considerable progress as a club, not exactly hindered by having the entire population of London and its suburbs from which to attract members. Jolly good luck to 'em anyway, and may their motors never seize!

Interest in model cars *does* appear to be growing in Stoke; so, perhaps, it won't be long before we see some more cars running.

I am sorry that I did not include enough details of my car in the short article I wrote about car activity in the Potteries; but the article was not written with the intention of describing my car. If this is desired, I shall be pleased to describe my humble efforts in model car building, and will submit for our Editor's approval, a short article on the car, with a few photographs of the "innards." I have neither the time nor the capabilities to produce a description such as Mr. Cruickshank gave of his car some little while ago, even if it be requested.

As my views on the Pioneer Club's rules are invited, I must add that, *at present*, there appears to be no room for improvement on them. I am glad that class A has become the "not exceeding 10-c.c. class," as this will enable other classes to be fixed, or rearranged, as proves necessary, without the danger of going beyond the 10-c.c.'s which *must*, in the interests of safety, remain the largest capacity permissible. This, I suggested in a letter a year or two ago, and I am beginning to wonder whether even this figure is too high. I think that any car or its accessories that appear unsafe should be investigated by all members present, and not allowed on the tethering cable if any doubt exists regarding the possibility of breaking loose.

At one meeting which Mr. Hopkinson and I attended in London, a harness length of *three* feet from centre of car to point of attachment was agreed upon, which rule the Pioneer Club altered to two feet. I suggest that this measurement should be standard throughout the country, and that the two-foot harness is a very suitable length. Certainly our cars give no trouble with this length harness, and it saves constant cable changing when all cars hook up to run on the same radius.

I'm afraid I cannot help Mr. Cruickshank with his "oil on the track" problem. We have never experienced it in any magnitude, probably for the simple reason that we have never been able to use a track for a long enough period to deposit much oil!

One final item, which I deliberately include to start an argument: the Americans have a rule which forbids any part of the cylinder or plug to project from the cockpit; in other words, the motor must be under the bonnet. Right, or wrong?

Yours faithfully,

Stoke-on-Trent. F. G. BUCK.

Clubs

Society of Model and Experimental Engineers

A rummage sale will be held at the workshop on Saturday, April 6th, at 2.30 p.m. Members and affiliated members are invited.

On Saturday, April 13th, there will be a meeting at 39, Victoria Street, Westminster, S.W.1, when a series of lecturettes will be given by members. Meeting commences at 2 p.m.

Full particulars from: Hon. Secretary, J. J. PACEY, 69, Chandos Avenue, Whetsone, N.20.

The Bristol Ship Model Club

The annual general meeting was held on March 12th, when about 25 members attended.

Mr. Bowness, as chairman, spoke of the growth of the club; there are now some 70 members. The year's work was reviewed and the main subject had been the club's share in the Joint Model Clubs' Exhibition at the Museum; also, the proposed model sailing pond, which had been discussed with the city engineer.

One excellent feature was the report of the committee's work; all seven members of the committee had 100 per cent. attendance record.

Mr. Bowness was thanked for his work as chairman, and the present committee was re-elected. Next meeting, April 9th.

Hon. Secretary: ARTHUR W. KIRTON, 29, New Fosseway Road, Knowle, Bristol 4.

Oldham Society of Model Engineers

At our last meeting, two of our younger members, Mr. J. Yardley and Mr. E. Brooks, gave an informative talk on "Sailplanes and the theory of Flight." Mr. J. C. Smith has promised a lecture on "Carpet Looms" for our next meeting, April 12th, in No. 3 room, Co-operative Educational Building, Foundry St., at 7.30 p.m.

Hon. Secretary: W. K. BUCKLEY, 87, Lyme Terrace, Highfield, Mossley.

The Chelmsford Society of Model Engineers

The above Society held its annual general meeting on February 23rd.

Mr. Bishop, the chairman, presided, and 26 members were present. The secretary said that activity had made progress, and membership was increasing week by week, and he was glad to welcome back old members who were now out of the services and eager to make a new start; so there seems good promise of some special achievement this coming year.

In the election of officers, all, with two exceptions, were re-elected; the next meeting will be on Saturday, April 27th, in the G.F.S. Hall, Cottage Place, at 3 p.m., when Mr. J. N. Maskelyne will give a talk on "Locomotive Topics." All interested are welcome.

Hon. Secretary: L. FODEN, 27, Highfield Road, Chelmsford.

The Bolton and District Society of Model Engineers

The next meeting of the Society will take the form of a "Brains Trust," and will be held on Tuesday, April 9th, at 7 p.m. The question master will be Mr. G. A. Marshall, and the questions will be answered by Messrs. Moss, Tongue and Walsh. Will all members bring their questions, written on paper, and hand them to the secretary before the meeting.

Hon. Secretary: A. H. BOOTHROYD, 113, Hilton Lane, Little Hulton, Near Bolton.

The North London Society of Model Engineers

The boats and yachts section will hold its opening meeting of the season at Broomfield Park, Palmers Green, on Easter Saturday, April 20th, at 3.30 p.m. This meeting forms an excellent chance for us to make the acquaintance of other model engineers, whether lone hands or members of other societies. Besides boats and yachts, we are interested in any form of model or light engineering.

Hon. Secretary: E. GUTTRIDGE, "Wykehurst," Parkgate Avenue, Hadley Wood, Herts.

The Leicester Model Aero Club

A model aero exhibition will be held at the Leicester College of Art and Technology, on April 26th and 27th, and will be opened by Sir W. Lindsay Everard. All types of models will be shown; other local clubs, individual modellers in the district, local model shops and the S.M.A.E. will be represented.

There are now about 16 model petrol engines in the Club, ranging from 1½ to 15 c.c.; so we should be able to show what we can do in the petrol field.

Hon. Secretary: T. T. LAVERICK, 80, Barbara Avenue, Leicester.

The Tyneside Society of Model and Experimental Engineers

More equipment is being installed in the Society's workshop, Manors Station, including a 3⅜ in. lathe and welding set. The multi-gauge and "O" gauge tracks are nearing completion. Workshop open Tuesday and Thursday evenings and Saturday afternoons. Meetings for April as follow: Wednesday, April 10th, at 7.30 p.m., at workshop. Lecture, "Hull Construction," by Mr. R. Anderson. Saturday, April 27th, 2.45 p.m., at Church Hall, Ridley Place. Lecture, "Atomic Energy," by Dr. W. E. Curtis, F.R.S.

Hon. Secretary: S. G. JONES, 56, Moor Crescent, Gosforth.

The Peterborough and District Model Engineering Society

After the "trials and tribulations" of the last few years, the above Society has once more got into its stride. During the war the locomotive section collected over £400 for charity. Our chairman, Mr. A. C. Lawrence, outlined our immediate programme, which includes some attractive features for all sections. We have now obtained tenancy of a club house and ground at Lincoln Road, Walton, and are looking forward to many enjoyable meetings. Most members have been able to carry on, and some fine work has been done. Notable amongst these is Mr. A. Mayle's 1½ in. scale Fowler Ploughing Tackle, which is a real "exhibition" piece of work. Several members have increased the size of their workshops, and we have enrolled some new members, but we are not getting the younger fellows; we are hoping to remedy this point in the near future.

Hon. Secretary: JOHN H. HURST, West Rays, Lincoln Road, Werrington, Peterborough.

The Sutton Model Engineering Club Ltd.

The annual general meeting for the presentation of accounts and election of officers and committee for 1946-7, will be held at the Garden Hall, Wellesley Road, Sutton, on Saturday, May 11th, at 8 p.m.

Members will learn with regret that Mr. A. L. Steels, the retiring chairman, will not seek re-election.

Nominations for officers and committee must be in the hands of the secretary by April 8th, 1946.

Voting forms may be posted, but must be accompanied by a remittance for the year's subscription. It is earnestly requested that members make it their business to be present in person at the meeting as postal voting is intended only to assist those who, through illness or other good reason, cannot attend. Postal voting papers must be in the hands of the secretary not later than mid-day on May 8th, 1946.

Members are reminded of the rule that notice of any proposal or suggestion must be forwarded to the secretary, in writing, by April 8th, 1946, in order that it may be placed on the agenda for the meeting.

Hon. Secretary: P. G. JOHNSTON, 9, Stanley Road, Sutton, Surrey.

Croydon Society of Model Engineers

The Society is expanding, but there are still vacancies for new members. In particular, it is desired to recruit a junior section. Any lad between the ages of 16 and 18 who is genuinely interested in some branch of the hobby may enrol at half-fees, *i.e.* 7s. 6d. per annum.

The Society, as an affiliated member of the S.M.E.E., has been invited, and is determined to stage a show at the forthcoming exhibition in August.

If any reader can help the Society to acquire the use of a sports pavilion and a strip of land for the erection of a portable loco. track, somewhere in the district, will he please communicate with the Hon. Secretary: L. G. BOOMER, 11, Tritton Avenue, Beddington, Croydon.

NOTICES

The Editor invites correspondence and original contributions on all small power engineering and electrical subjects, which should be addressed to him at Cordwallis Works, Maidenhead, Berks. Matter intended for publication should be clearly written, and should invariably bear the sender's name and address.

Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All correspondence relating to sales of the paper and books to be addressed to THE SALES MANAGER, Percival Marshall and Co. Ltd., 23, Great Queen Street, London, W.C.2.

Correspondence relating to display advertisements to be addressed to THE ADVERTISEMENT MANAGER, "The Model Engineer," 23, Great Queen Street, London, W.C.2.

"THE MODEL ENGINEER"
SALES AND WANTS

Private: **Threepence** *word. Trade*: **Sixpence** *word. Use of Box* **2/6** *extra. Minimum charge,* **3/-**

TOOLS & WORKSHOP

Buck and Ryan's Department for Lathes, Drilling Machines, Grinders, Electric Tools, Chucks, Surface Plates, Lathe Accessories and Tools.—310-312, Euston Road, London, N.W.I. Telephone: EUSton 4661. Hours of Business: 8.30 to 5.0 p.m., Monday to Friday; Saturday, 1.0 p.m.

Silver Steel Rounds, Squares, Asbestos Sheet, String, B.M. Steel Rounds, Squares, Angles, Flats, Brass Rounds, Squares, Flats, Hexagons, Sheets, Copper Tubes, Rounds, Squares, Sheets, Screws, Nuts, Drills, Taps, Dies, Rivets. S.A.E. for lists.—S. REED & SON, 89, Keresley Road, Coventry.

Split Chucks for Watchmakers Lathes, 6 mm., 6½ mm., and 8 mm., at 7s. each, postage 6d.—JOHN MORRIS, 64, Clerkenwell Road, London, E.C.1.

"Tool News" keeps you up-to-date. Specimen copy 6d., post free.—GARNERS, Sheffield Road, Barnsley.

Bench Lathes, Bench Millers, Pedestal Drills, Myford Spares, Lathe Tools, Milling Cutters, Slitting Saws, Chucks, Micrometers, small Tools for delivery from stock.—F. W. KUBACH, 12, Sylvan Road, Upper Norwood, London, S.E.19.

Small Wood-planing Machine, about 9", or combined planer and saw bench (Tyzack or similar) wanted immediately. New, or as new.—WHITSON, Stoneycroft, Newlands, Keswick.

S. A. Linstead wishes to thank all readers who replied to advertisement of January 10th, 1946, and apologies for unfortunate delays, due to illness. All orders are being dealt with. Thank you.

3½" Super Exe, complete, 2 chucks fitted by makers. Exe countershaft, A.C. Motor. Used only a few hours. Best offer secures.—CARPENTER, 53, Wellstead Avenue, Edmonton, London.

Wanted, 2" to 3" Centre Lathe, with or without tools and accessories. Full particulars and price to—E. DELLOW, 45, Cromwell Avenue, Cheshunt, Herts.

Wanted, 3½" to 4½" Lathe, in good condition. Particulars—7, Kelham Green, Gordon Estate, Nottingham.

For Sale, Brown & Sharpe Micrometer 0-1", Bright, Ratchet and Locknut, brand new, 50s.—WILSON, 7, Lockmead Road, London, N.15.

Ball Races, ½" Self-aligning in Housing, 9s. pair; ⅜", ½", ⅝", 4s. pair; 16 and 24 D.P. Stainless Pears, from 6d.; 110 D.C., 230 D.C. Motors, 30s., 40s., carriage paid. S.A.E. please.—WILSON, 134, Thorntree Road, Thornaby, Yorks.

For Sale, Atlas 5" Lathe, 24" between centres, complete with stand, Vee drive countershaft, motor, power cross feed, fixed and travelling steadies, 6" S/C chuck, faceplates and all change wheels. Almost new, nearest to £100; also ½" Bench Drill, 4-speed Vee belt with motor, £12. Can deliver London area.—Box No. 3953, MODEL ENGINEER Offices.

Wanted, a small Bench Miller with cutters to suit spindle. For sale, Stand, Chiptray with attached countershaft for a Myford 3½" lathe, ½ h.p. motor to suit.—ERITH, 15, Gresham Road, Edgware, Middx.

Castings and Blue Prints for "Eureka" sawing, drilling and filing machines now available. Gear cutting and machining.—POYSER, Tool Maker, Peck's Hill, Mansfield.

Wanted, Super Adept or 2" Lathe (approx.)—45, Symonds Road, Preston, Lancs.

For Sale, Myford 3½" × 24" Screwcutting de luxe Lathe, stand and tray, motorised, Metrovick ¼ h.p., 50 cycles, 230 volts motor, faceplate, foot motor, four-and three-jaw chucks, tools, vertical slide, all only slightly used and stored. Lathe packed in fitted case, £40. Buyer collects.—Box No. 3955, MODEL ENGINEER Offices.

Materials. Sheet, strip, rod, tube, etc., in ebonite, fibre, duralumin, gunmetal, brass, steel, etc., Screws, Nuts, etc. S.A.E. for list "M."—RETAIL MATERIAL SUPPLIES, 377, Milkwood Road, Herne Hill, London, S.E.24.

Model Ships Rigging Ropes, etc., Phosphor Bronze, from 2s. 100 ft., 3 to 8 wires. Stamp, samples.—PARTRIDGE, 39, Swan Street, Attercliffe, Sheffield.

5"-6" Shardlow Micrometer, £3; 0-6" ditto, £7; Newall Dial Indicator, reading .0001", £5; 4" × 10" Surface Plate, £1; 1"-3" Telescopic Gauge, 10s.; 12 flat belt Pulleys, 2½", 3", 4", 5", 6", 9" and 10", from 2s. to 6s. each.—Box No. 3957, MODEL ENGINEER Offices.

3" to 4" Lathe Wanted, motorised, good condition. 'Phone: Wembley 5132, after 7.0 p.m.

Sale, Adept Shaper 2, brand new, £14; "Shop, Shed, Road," 12s. 6d.; 4-Step Treadle, Vee ball-bearing, £2.—Box No. 3960, MODEL ENGINEER Offices.

Machine Tools. Southbend Lathe, £85; another, £97, both motorised; Atlas Lathe, £60; another on stand, motorised, £67 10s.; Lorch Precision Lathe, £40; all-geared Crowthorn, 6½" gap bed, motorised, Norton gearbox, £165; Exacta Capstan, motorised, £50; Centac Bench Miller, motorised, £30; Ajax Bench Miller, £42; Vertical Miller and Die Sinker, swivelling and tilting table, £40; Mikron Internal gear Shaper, £35; Brown & Sharpe 18 × 6" Cylindrical Universal Grinde, £125; Schutte, motorised, Surface, Cylindrical and Tool and Cutter Grinder, hydraulic feed, £200; Capco Surface Grinder, £87; Colchester Master 6" Lathe, £85; Lodge 16½" × 15 ft. Lathe, £120; Crooks Roberts 10" gap bed Lathe, 22 ft. long with extension to 30 ft, £50; Broadbent, 10" × 17 ft. Lathe, £50; also Ward & Herbert Capstans, about 25 S/C. Lathes, Milling Machines, Drills, Power Hacksaws, Turret Lathes, etc. List on request. Inspection any time, or week-ends by appointment.—VICTA ENG. COMPANY, Thicket Corner, Maidenhead. 'Phone 50.

Drill Stands, 1-60, 2s. 6d.; 1/16" to ½", 2s. 6d.; Drill Gauges, 1-60, 10s. 6d.; 61-80, 13s.; 1/16"-½", 12s.; Drill Chucks, 0-½", M.T.1, 37s.; 0-½", 10s. 6d.; 0-⅜", 12s. 6d.; B.A. 0-6 Socket Spanner set 7, 4s. 6d.; Roller Bearing Lathe Centres, 2 M.T., 104s. 6d.; 3 M.T., 104s. 6d.; Automatic Centre Punches, 7s. 6d.; V-Blocks Clamp, 15s. 6d. Lathe Centres M.T.1, 3s. 9d.; 2, 5s. 6d.; 3, 5s. 8d.; 4, 11s. 3d.; Burnerd Self-centring Chucks, 4", 97s. 9d.; Steel Stamps, A-Z, 1/16", 16s. 6d.; 3/32", 16s. 6d.; ⅛", 17s. 6d.; Figures, 0-9, 1/16", 5s. 6d.; Micrometers, M. & W., Lock Ratchet, 1", 34s.; H.S. Woodruff Cutters, No. 2, 12s.; 8, 15s. 6d.; Hollow Mill, ¼", 17s.; Dies, 13/16", 40 threads, ¼", 5/32", 7/32", ⅜", each 2s. 6d.; B.A., 0-6, 2s.; 7-8, 2s. 6d.; 9-10, 3s.; 11, 4s. 9d.; Whit., 1/16", 3s.; 5/32", 3/16", ¼", 2s.; B.S.F., 3/16", ¼", 2s.; 1" diameter, ¼" 32, 5/16" 32, 9/32" 32, ⅜" 32, 5/16" 40, ⅜" 40; U.S.A. Whit. 7/32", 7/16", above 4s. each; British Whit. ¼", B.S.F. ½", 3s.; 1 5/16" diameter, 7/16" 32, 7s. 3d.; ½" 32, 7s. 3d.; Dieholders, 1", 4s.; Superior, 5s. 6d.; H.S. Reamers, 5/16", 6s. 9d.; ⅜", 7s. 6d.; Expanding, 23/32"-25"/32, 21s.; H.S. Drills, 1-2, 2s.; 3-6, 1s. 11d.; 7-11, 1s. 10d.; 12-16, 1s. 9d.; 17-18, 1s. 8d.; 20-24, 1s. 7d.; 25-29, 1s. 6d.; 30-32, 1s. 5d.; 33-42, 1s. 4d.; 43-48, 1s. 3d.; 49-52, 1s. 2d.; 53-80, 1s. 1d.; 1-57 mm., 1s. 1d.; 2-5 mm., 1s. 4d.; 8-5 mm 3s. 6d.; H.S. 1/16", 1s. 2d.; 5/64", 1s. 3d.; 3/32", 1s. 4d.; 7/64", 1s. 4d.; ⅛", 1s. 5d.; 9/64", 1s. 6d.; 5/32", 1s. 7d.; 11/64", 1s. 8d.; 3/16", 1s. 9d.; 13/64", 1s. 11d.; 7/32", 2s.; 15/64", 2s. 3d.; ¼", 2s.; 17/64", 2s. 7d.; 9/32", 2s. 9d.; 19/64", 3s.; 5/16", 3s. 3d.; 21/64" 3s. 6d.; 11/32", 3s. 9d.; 23/64", 4s.; ⅜", 4s. 3d.; 25/64", 4s. 6d.; 13/32", 4s. 9d.; 27/64", 5s.; 7/16", 5s.; 29/64", 5s. 3d.; 15/32", 5s. 6d.; 31/64", 5s. 9d.; ½", 6s.; Steel Rules Chesterman, 6", 1s. 10d.; 24" (none fold), ideal marking out, 13s.; Unique Test Indicators, 5s.; Gauges Radius, 20 blades, 6s.; Centre, 1s.6d.; Screw Whit., 3s. 6d.; Combination Pliers, 6", 2s. 9d.; Steel Squares, 6", 5s. 8d.; Files Swiss Warding, 6", 2s.; Flat, 12", second cut, 2s. 6d.; 12" Bastard, 2s. 5d.; Silver Steel, 13" lengths, round 1/16", 4s. 10d.; 3/32", 3s. 6d.; ⅛", 3s.; 5/32", 2s. 9d.; 3/16", to ⅝", 2s. 6d. per lb.; square, 13", 5/16", ⅜", per lb. 5s. Pin Vice, 7s. 6d.; set 4 Pin Chucks, 15s.; Emery Wheels, 2", 1/16", 11d.; 3", 1/16", 1s. 3d.; 3", ⅜", 3s. 5d.; 3½", ¼", 3s. 6d.; Carborundum 4", ¼", 4s.; 3½", ⅜", 4s.; 7" × ½", 7s. 6d.; Glaziers Diamonds, 10s., 12s.; Bell Centre Punches, 5s. 2d.; H.S. Slitting Saws, 2½" × 3/32", 6s. 3d.; 3" × 1/16" 6s. 3d.; 3" × 5/64", 6s. 6d.; 3" × 1/8", 7s. 3d.; 3½" × 3/64", 8s.; 4" × 1/32", 12s.; 4" × 1/16", 8s. 6d.; 4" × 5/32", 11s. 6d.; 5" × 3/64", 16s.; 5" × 5/32", 17s.; 6" × 5/64", 17s. 3d.; Myford M.A. 97, Bench Motor Unit, flat belt, 81s.; Taps Semi H.S. B.A. 3-5, 9-10, 3/32" Whit., 1s. 6d. each; 40 threads, 5/32", 3/16", 7/32", ¼", 1s. 9d.; 5/16", ⅜", 3s.; 32 threads, 9/32", 2s.; 5/16", 2s.; ⅜", 2s. 3d.; 7/16", 3s.; ½", 4s. Whit., 1/16", 1s. 6d.; ¼", 5/32", 3/16", 7/32", ¼", 11d.; 5/16", 1s. 3d.; ⅜", 1s. 6d.; 7/16", 2s.; ½", 2s. 3d.; ⅝", 3s. 3d.; B.S.F. 3/16", ¼", 11d.; 5/16", 1s. 3d.; ⅜", 1s. 6d.; 7/16", 2s.; ½", 2s. 3d.; ⅝", 3s. 3d.; B.A. 0-6, 11d.; 7-8, 1s. 2d.; 12, 2s. 6d.; ¼" Gas, 2s. 6d.; 5/16" 26, 1s. 3d.; Pawson Tapper M.T. No. 1, 0-⅜", £9 7s.; Paraffin Blowlamps, 1 pint, 24s. 9d.; Vanadium Spanners, ¼", 9/16", set 7, 30s.; South Bend, 4½" Lathe Spares, Milling Arbor, 30s.; Faceplate, 8", 28s.; Step Chucks and Closers, int.-ext., set £8 10s.; Collets 1/16", 5/64", 3/32", 13s. 6d. each; 7/64 to ¼", 12s. 6d. each.; H.S. Tool Bits, 5/16" × 3", 1s. 10d.; ½" × 4", 4s. 4d.; ⅝" × 4½", 7s. 3d.; End Mills, ¼", 7s. 6d.; Die 1½", 10 mm. × 1.5, 10s. 6d.; Tailstock Dieholders 13/16", 1.M.T., 9s. 6d.; 4 B.A. Steel Nuts, gross 2s. 6d.; H.S. Centre Drills, size 4, 1s. 8d.; post free over 10s. Pay cheques, P.Os. to—S. GRIMSHAW. Post orders only, letters to—S. GRIMSHAW, 7, Hall Street, Gorton, Manchester 18. (Warehouse), Gorton Lane, Gorton.

Shaft Hangers, fully adjustable, ⅝" bore, 7s. 6d. each; Circular Saws, 6", 10s.; 4", 6s. each; Acetylene Burners, doz. assorted, 2s. 9d.—BARDWELL, 473, Abbeydale Road, Sheffield.

Wanted, Southbend Lathe, a high price offered for one in really good condition. Will arrange collection.—DAVIS, 32, Andrew Lane, Bolton.

Stainless Steel, machinable, 3/32", 2d.; ⅛", 3d.; 5/32", 5d.; 3/16", 7d. ft.; other sizes, 1/16" × ½"; Copper Rivets, 8d.; 3/32" × ¼", 1s.; ¼" × ⅜", 1s. 6d.; 4, 5, 6, 7, 8 B.A. Screws, CH/CS. ⅜-½", 2s. gross; ¾", 1", 2s. 6d. gross; Steel Full Nuts, 4, 5, 6, 3s. gross; 7, 3s. 6d. gross; 8, 4s. gross; Brass, Copper Sheet, Rods, Brass Angles, Easyflo, Sifbronze, Steel Angles, Rods. Lists.—REEVES, 81, Cole Valley Road, Birmingham 28.

MODELS & FITTINGS

Apex and New Atom Minor (Mr. Westbury's design). Engine castings in our latest attractive finish now ready. Carburettor castings (described June 14th issue MODEL ENGINEER), and spiral timing gears for Apex, ball-races, piston rings, miniature plugs, contacts and other requirements. Send us your enquiries. Trade also invited.—THE HEADINGLEY MOTOR & ENGINEERING CO. LTD., 8, Otley Road, Leeds.

Building "Hielan' Lassie?" Materials from—MAXTED, Central, Chatham Street, Ramsgate.

"Lumec" 9.5 Projector, detailed drawings, 9s. 6d., gearing and optics can be supplied, particulars 4d.—RACET DESIGNS, 46, Orchard Way, Walton Road, Chesterfield.

Duplicate Locomotives of the, L. & S.W.R. Illustrations Building Dates, Classes, etc., 2s. 1d. post free.—RAILWAY HOBBIES LTD., 86, Essex Road, Southsea, Hants.

"Featherweight" Guaranteed Coils, 1½ oz., 25s.; 1 oz., 37s. 6d. Trade enquiries invited.—THE MODEL STORES, 26-27-28, The Extension, Shepherds Bush Market, London, W.12.

Locomotive Boiler, suit 7½" gauge steel with 7 1¼" tubes, 2 ft. long, firebox 8" × 8", by Goodhand, only steamed 4 times, w.p. 130 lb., insured. Also vertical engine 2" × 3¼", 3" Lathe with back gear but no slide rest, ½ h.p. repulsion/induction motor, 230 volts Austin 7 engine, Prices, boiler, £45; Engine £5; Lathe £5; Motor £7 10s. Austin engine, £20. All on view Sundays in March at M.T.B., 102, Lady Bee Ltd., Southwick, Sussex. Reply to—PARKINSON, Sea Wall, Brightlingsea, Essex.

For Sale, Brown Junior 10 c.c. Engine, complete with plug, coil, condenser and propeller, £6.—KNAPP, 73, Deepdene Vale, Dorking, Surrey.

Wanted, 7½" Gauge Locomotive, with or without track and vehicles.—Box No. 3956, MODEL ENGINEER Offices.

Boiler Building and Brazing Service. Quotation gladly given against drawing. All work tested and guaranteed. Cylinders machined, wheels turned, valve gear parts made to order. Easy-flow and screws in stock.—WEMBLEY MODELS, 6, Park Road, Wembley.

Two Horizontal Steam Engines, 2¼" × 3½", £3; ⅞" × 1½", 50s.—2, Farnon Road, Gosforth, Newcastle-on-Tyne.

1" Scale N.E.R. Atlantic, with new ⅛" brazed copper boiler, engineer built, fine hauler, £130; two 3½" gauge tank locomotives, Stuart horizontal engine, several hand pumps, ½"-¾" rams, 2 copper 6" dia. riveted vertical boilers with all fittings, many bits and pieces useful to model engineers. No reasonable offers refused. Can be seen by appointment.—32, Church Road, Watford.

For Sale, ¾"-3½" gauge coal-fired "Maisie." Good sound job.—ARNOLD 5437.—Box No. 3958, MODEL ENGINEER Offices.

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